SOCIO-ECONOMIC SURVEY
OF
SMALLHOLDER FARMING SYSTEMS IN SOLOMON ISLANDS

KOLOMBANGARA
WESTERN PROVINCE

Agricultural Economics Section
Rural Services Project
Ministry of Agriculture and Lands
Solomon Islands

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Abbreviations and Units of Measure

AES	Agricultural Economics Section (RSP)
CEMA	Commodities Exporting and Marketing Authority
DCRS	Dodo Creek Research Station
LDA	Livestock Development Authority
MAL	Ministry of Agriculture and Lands
PBME	Project Beneficiary Monitoring and Evaluation (RSP)
RDC	Rural Development Centre (RSP)
RSP	Rural Services Project
km	kilometre = 1,000 m
ha	hectare = 10,000 sq m
m	metre
MT	metric tonne = 1,000 kg
SI$	Solomon Islands Dollar

Acknowledgements

The present report is produced by the staff of the Agricultural Economics Section. The Section was established under the ADB/IDA/IFAD assisted Rural Services Project and is engaged in a two years socio-economic study of smallholder farming systems throughout Solomon Islands, extending from 1987 to 1989.

Many others contributed to the planning of the programme and in its implementation. The study would not have been possible without the support and patience of local people. To them we are grateful and hope that the present report will be in some way of benefit.

We would like to thank members of the Ministry of Agriculture and Lands, in particular the Director of the Rural Services Project and staff, and the Chief Research Officer and staff for their support throughout.

The Statistics Office of the Ministry of Finance has assisted the survey through the generous lending of equipment, canoes and outboards, and in sampling. Thanks are especially due to Richard Harris, Rural Statistician, for his interest in the survey from the outset.

Not least, thanks are extended to the Premier of Western Province, the Provincial Secretary and staff, the Principal Field Officer and members of the agricultural extension service for their support in establishing the survey. It is especially hoped that the present report will find a practical application in development works being undertaken in the Province.

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Solomon Islands

Chapter: 1
INTRODUCTION

1.1 The Solomon Islands comprise a double chain of islands extending in a north-west south-east direction over 860km of the south-west Pacific between latitudes 5°-12°S and longitudes 155°-170°E. The islands lie directly along a major line of crustal weakness traversing the western Pacific and are the surface expressions of fault-bounded blocks and troughs originating in a zone of geologically intense activity. Warping and block movement are the most significant geomorphic processes responsible for the elevation of land to its present altitude, with marine sediments occuring on some of the highest ranges. Such processes continue spasmodically and raised reefs at various heights occur in many parts of the country, as does intense faulting. Earthquakes are frequent and often initiate land movements in ground already close to shearing point such as saturated soil at the heads of steeply incised gullies, resulting in debris slides among the high ridges[10].

1.2 Solomon Islands lies well within the geographical tropics in an oceanic area where two contrasting trade winds meet, a low-pressure belt of ascending air known as the "inter-tropical convergence zone" (ITCZ). In this zone warm and humid air masses drawn from equatorial regions meet relatively cool and dry sub-tropical air derived from the south-east. From about March to November the islands experience steady, shallow, south-easterly winds. During November and December unsettled weather is likely as the ITCZ moves south over the islands, from which follows steady north-westerly winds. March and April are again unsettled as the ITCZ returns northwards until the south-easterly trade winds become re-established. Cyclonic disturbances may be generated, particularly around December and April when the convergence of the two air streams is strongest. Weather is varied, both temporally and spatially, but is characterised by continally high average temperatures and humitity. Most land areas have a mean annual rainfall of 3,000-5,000mm with variations depending on latitude and orientation to prevailing winds. Temperatures are more uniform, at around 26°C in the lowlands, and never reach extremes which would restrict plant growth. Night time humidity exceeds 90%. This may fall to 60% on clear sunny days, or remain close to saturation point during cyclonic conditions[10].

1.3 The islands are rugged, with a predominance of ridge-valley landscapes and high relief. Undulating rolling landscapes have a limited distribution and extensive fluvial plains are uncommon. Chemical weathering is intense under conditions of continuously high temperature and moisture, however, soil depths are not generally great. Most hill areas have slopes exceeding 12-15° and commonly reach 35-55° among the mountain ridges. Continual soil wash and creep and periodic mass movements effectively keep pace with rock weathering. Only on stable flatter sites do deep profiles develop. The islands for the most part are covered in dense forest, some fire disclimax grassland in parts of Guadalcanal and Florida Islands, and land cleared or cultivated[10].

1.4 The population of Solomon Islands from the 1986 census was **285,176**, with an annual growth rate of **3.5%**. The land area of **28,370sq km** gives a low overall population density of **10** persons per sq km. Settlements are mostly along the coastal margins so that in some parts of the country population densities are high.

1.5 The population distribution of Solomon Islands is summarised in diagram 1.1 and key socio-economic data are presented in table 1.1

1.6 There is a considerable variation between land area and population among the provinces. While Western Province accounts for 33% of the national land area it contains only 19% of the population. The West is characterised by low population density compared to provinces such as Central, Malaita and Temotu. Although Temotu contains 5% of the national population it also accounts for only 3% of the national land area, and therefore has a relatively high mean population density. Land area in Solomon Islands is summarised in diagram 1.2.

Table: 1.1
SOLOMON ISLANDS KEY DATA

Province	Western	Ysabel	Central	Guadalcanal	Honiara
POPULATION					
1986 population	55,250	14,616	18,457	49,831	30,413
annual growth rate	3.0	3.2	2.9	4.3	6.8
% national population	19	5	6	17	11
peri-urban population	3,710	1,901	1,622		30,413
% peri-urban	7	13	9	38	
number of households	7,942	2,362	3,079	8,072	4,317
LAND AREA					
land area (sq km)	9,312	4,136	1,286	5,336	22
% land area	33	15	5	19	0
population density/sq km	6	4	14	9	1,382
1987 PROVINCIAL GOVERNMENT REVENUE AND EXPENDITURE (SI$'000)					
revenue	443	173	191	281	1,033
grants	2,556	634	623	1,247	704
current expenditure	3,504	849	750	1,431	1,561
capital expenditure	200	58	88	192	177
net revenue (negative)	(705)	(100)	(24)	(96)	(2)

Province	Malaita	Makira	Temotu	Total
POPULATION				
1986 population	80,032	21,796	14,781	285,176
annual growth rate	2.7	3.6	2.8	3.5
% national population	28	8	5	100
peri-urban population	3,252	2,588	1,295	44,781
% peri-urban	4	12	9	16
number of households	12,417	3,278	2,375	43,842
LAND AREA				
land area (sq km)	4,225	3,188	865	28,370
% land area	15	11	3	100
population density/sq km	19	7	17	10
1987 PROVINCIAL GOVERNMENT REVENUE AND EXPENDITURE (SI$'000)				
revenue	339	485	160	3,103
grants	1,891	1,095	445	9,195
current expenditure	2,190	1,472	615	12,371
capital expenditure	331	600	0	1,646
net revenue (negative)	(291)	(492)	(10)	(1,719)

Source: Statistics Office Statistical Bulletin 15/87 "Provincial Statistics"
Populationa data revised from Statistics Office Statistical Bulletin 3/88 "Solomon Islands Population Census"

POPULATION COMPOSITION

% by province

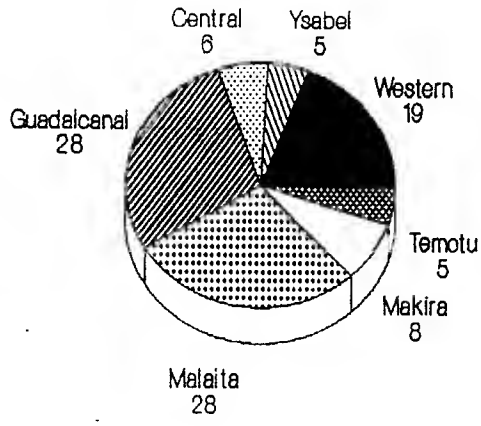


Diagram: 1.1

LAND AREA

% by province

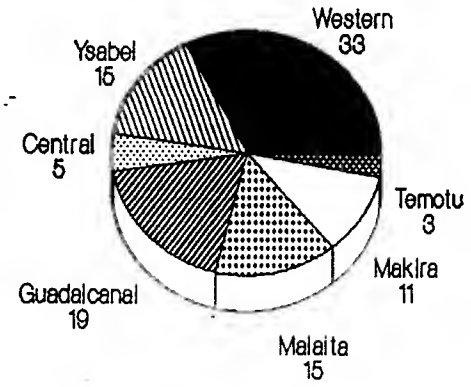


Diagram: 1.2

1.7 While a provincial comparison presents a broad indication of population densities throughout the country, differences within provinces are of significance to agricultural policy. With improvements in communications and administrative links there has been a general migration to the coastal margins where travel and marketing are easier, and where services such as schooling and health are more readily available. The highland interior tends to be sparsely populated in comparison.

1.8 While the overall population density is low, in some areas a growing population pressure is causing concern. Traditional farming systems based on forest fallow may be sustained under conditions of low pressure, but run into soil fertility and related problems when fallow periods are reduced and cropping intensified. Conversely, there are sparsely populated areas of agricultural potential where communications and services are poorly developed. The Rural Services Project is developing facilities in areas of high agricultural potential, providing marketing and transport infrastructure, agricultural and training services, and extending the coverage of adaptive research. These provide new opportunities for agricultural development.

1.9 The capacity of government to implement development programmes is to a large extent determined by funds and resources available. Diagram 1.3 summarises provincial government revenue and expenditure in 1987. Nationally there was a deficit of SI$1.7 million arising through over expenditure in all provinces. Provincial finance is characterised by a low revenue earning capacity, being nationally about one third of the level of central government grants. Revenue and grants are expended almost entirely on basic operating costs, although these remain severely constrained and under-funded. There are little or no funds for development, and investment amounted to only 12% of total expenditure in 1987.

1.10 Agriculture accounted for 42% of export earnings in 1985[11], although this has dropped from the much higher level of 87% in 1960. It is the major employment activity in the country and the source of livelihood for the majority of the population.

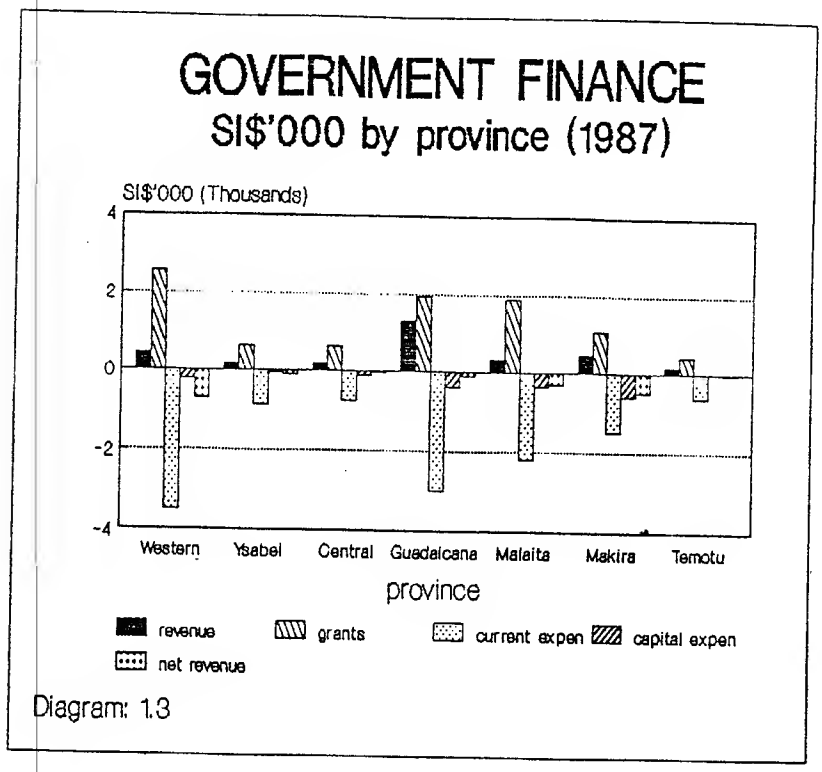


Diagram: 1.3

1.11 Despite various studies undertaken in the past, there is little hard socio-economic data on smallholder farming systems which would assist agricultural policy makers, trainers, extension workers and researchers in the planning, implementation and evaluation of development activities. A national sample survey of agriculture was conducted in 1974-75 [5], but these data are are no longer able to satisfy information requirements.

1.12 The Agricultural Economics Section (AES) was established under the Rural Services Project (RSP) inter alia in order to generate statistical information on smallholder production systems for the quantification of constraints to agricultural development and the devising of appropriate agricultural research programmes. The present study is part of a national survey programme to generate detailed base-line data on smallholder farming systems.

1.13 Since September 1987 AES has conducted a series of farming systems surveys in selected sites throughout the country, such as in the immediate areas of influence of Rural Development Centres or in other areas of special agricultural interest. It is intended that the findings of the survey will find application in the evaluation of development activities, and will assist in the assessment of changes taking place in Solomon Islands agriculture and the formulation of development strategies. The background and justification for the survey programme are documented in the AES Inception Report of 1987 [20]. Methodologies are described in the Agricultural Economics Field Survey Manual [21] and related documents produced by AES.

1.14 The Kolombangara survey was chosen in consultation with Western Province, being an important area of agricultural production, particularly to Gizo and Noro, and the location of a Rural Services Project Rural Development Centre ((RDC). The RDC is located to the south-east of Kolombangara, in an extensive area of low density settlement on alienated land. Given that settlement has only taken place recently there is little to be gained from a detailed farming systems survey on the east coast at this time. The survey therefore takes place on the western coast of Kolombangara, from Hunda to Nusamahiri (Varu I) and characterised by much higher population density on custom land. Field work was conducted from March to April 1989 in which a sample of 40 rural households was covered. Two stage systematic random sampling was guided by the Statistics Office based on equal probability of household selection. Villages were listed from the 1986 population census and selected by systematic random sampling. A pre-determined number of households within each village (or cluster of small villages) were then selected by simple random sampling. Maps of the survey area are presented in diagrams 1.4 and 1.5.

1.15 The survey is designed to investigate the structure and dynamics of smallholder crop and management systems. Of particular importance in the socio-economics of smallholder agriculture is the allocation of labour, since few cash inputs are applied and little wage labour is employed.

1.16 All cultivated areas, including cropped and cleared land, are measured by tape and compass to an error tolerance of 5%. Crop areas are computed and checked in the field by programmable calculator. Data are processed in "dBASE III Plus" databases and analysed through "SPSS/PC+". Raw output is transferred to "Lotus 123 vr 2" spreadsheets for tabulation and secondary processing. Text tables are incorporated into "Wordstar Professional r 4" and graphics are edited in "Harvard Presentation Graphics".

1.17 The Agricultural Economics Programme is sponsored under the Rural Services Project of the Ministry of Agriculture and Lands which is co-financed by the Government of Solomon Islands and ADB/IDA/IFAD. Data processing and the presentation of results has been made possible by the generosity of the Government of New Zealand through its Miscellaneous Technical Assistance Programme. This has overcome a primary constraint to work of this kind in the Ministry of Agriculture and Lands through the provision of computing hardware.

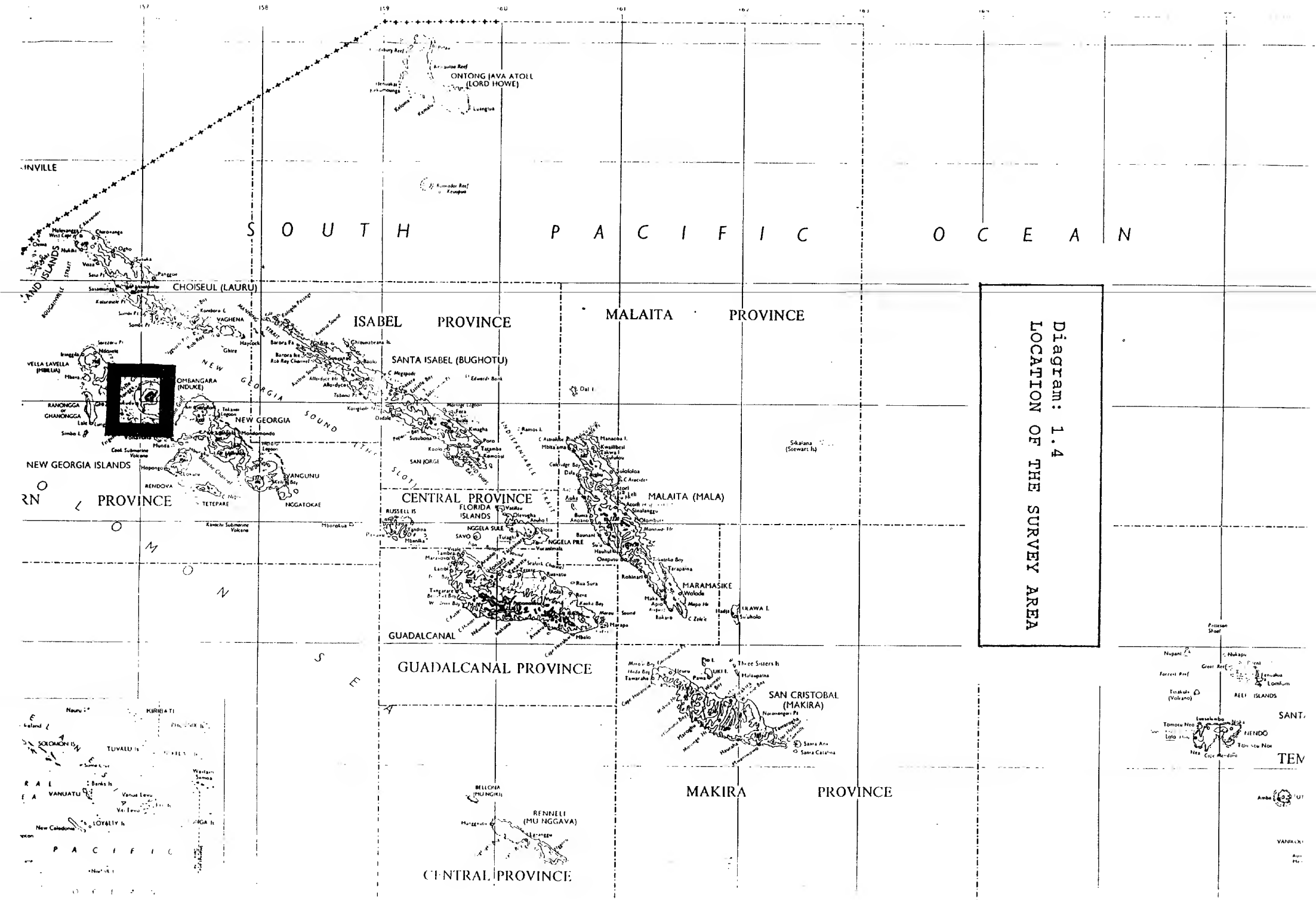
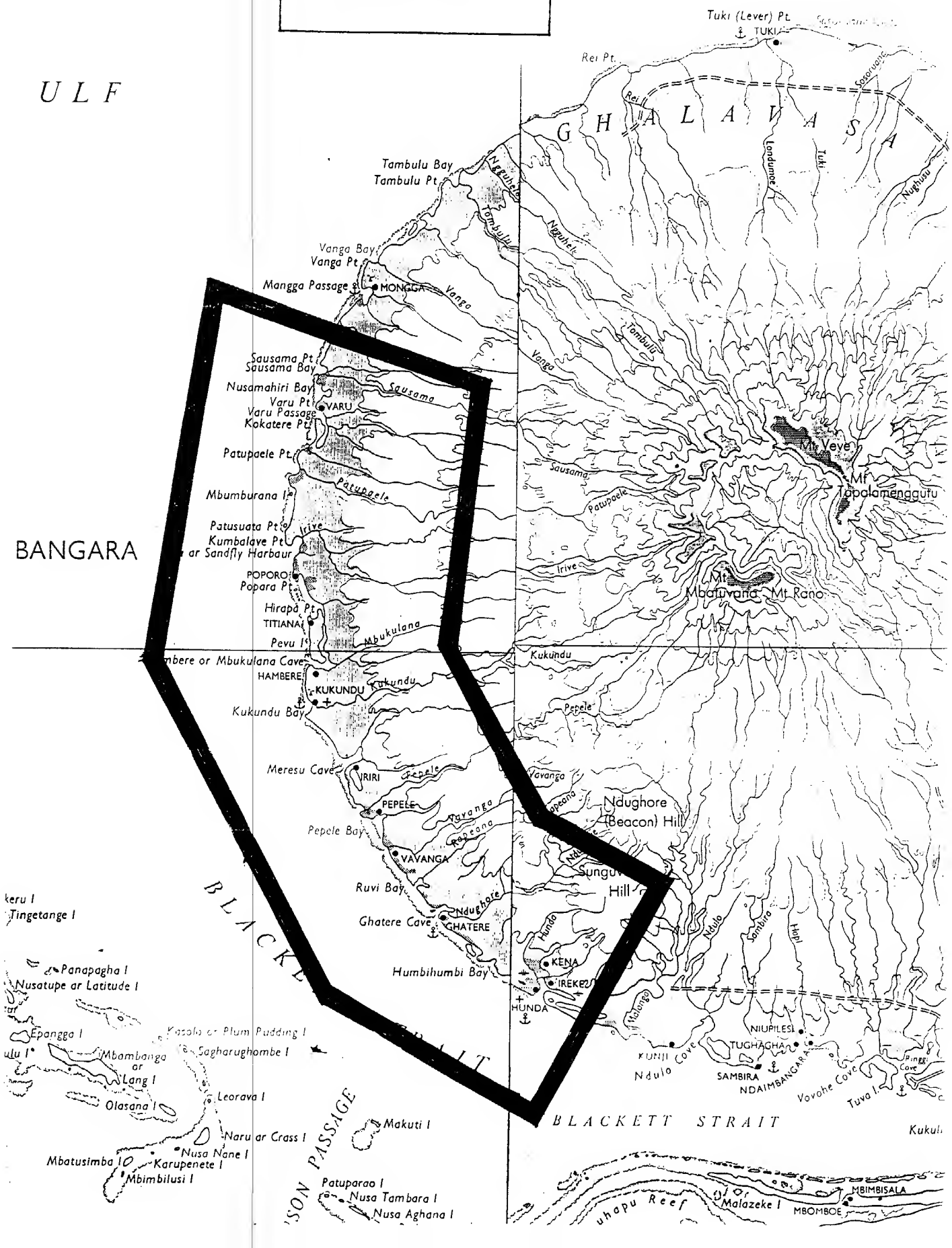


Diagram: 1.4
LOCATION OF THE SURVEY AREA

KOLOMBANC
(NDUKE)

Diagram: 1.5
SURVEY AREA



Chapter: 2
SUMMARY AND MAIN FINDINGS

Household Composition

2.1 The mean household size in the survey area is 6.01, comprised of 3.24 males to 2.77 females, a ratio of 1:0.85 males to females.

2.2 In the sample of 40 households the available labour composition of rural households in the survey area is 53% male and 47% female, a ratio of 1.99male:1.76female out of a total of 3.75 adult equivalent labour units per household.

Income Earning Activities

2.3 Agricultural income earning activities in the survey area are predominantly the sale of copra, food crops and fishing. 68% of sampled households earn income from copra sales and 65% earn income from food crops. 13% of households earn income from minor cash crops and 3% from livestock. 30% of households earn income from fish, but not from shellfish or crabs of any kind due to the strong influence of the Seventh Day Adventist Church.

2.4 10% of households earn income from a profession, in teaching or government service. 5% of households have a business and 8% have a skilled trade.

Extension and Mass Media

2.5 55% of households listen to agricultural programmes on the radio. Simple written materials may be appropriate in extension since 100% of households have at least one member with some reading and writing ability.

2.6 13% of households are visited by agricultural extension workers and 18% of farmers have attended an agricultural training course.

Livestock

2.7 There is a low level of commercialism in livestock management where the most important livestock are chickens. The survey area is unusual in the very minor importance of pigs, due to the influence of the Seventh Day Adventist Church.

2.8 **3%** of farmers keep cattle with a mean herd size of **2.00** among owners.

2.9 Chickens are kept by **38%** of households with a mean flock size of **9.73** among owners and **3%** of households keep ducks with a mean flock size of **3.00**.

Holding Size Distribution

2.10 The mean holding size in terms of area farmed is **0.948ha** and the holding size distribution is quite highly skewed.

2.11 While holdings are on the whole small, there is a high degree of inequality in holding size is due to a high proportion of farmers with very small holdings and a few relatively larger holdings which account for a substantial proportion of the cropped area. Tree crop holdings tend to be larger than non-tree cropping holdings, with a mean size of **2.254ha** and represent **38%** of farmers. Conversely non-tree cropping farmers have a mean holding size of **0.132ha** and represent **62%** of sampled farmers.

2.12 The mean food crop area among all farmers is **0.120ha** and the mean tree crop area among tree cropping farmers is **2.152ha**.

Labour Density

2.13 The mean labour availability is 3.78 adult equivalent labour units per farming household, resulting in a mean labour density of 3.99 labour units per hectare. There is no apparent association between labour availability and holding size but labour density per unit area falls rapidly from 36.68 labour units per hectare on holdings of less than 0.25ha in size to 0.43 labour units per hectare on holdings of 5 - 10ha in size. On non-tree cropping holdings the mean labour density is 31.08 labour units per hectare compared with 1.46 labour units per hectare on tree-crop holdings. Labour availability is therefore likely to be limiting only on the larger tree cropping holdings.

Cropping Patterns

2.14 The average holding size is 0.95ha, however, a distinction is made between farmers with tree crops and those with no tree crops. Of households with tree crops the mean holding size is 2.25ha, of which 2.15ha is under tree crops and 0.10ha is food crops. In contrast non-tree crop farmers have a mean holding size of 0.13ha under food crops. Despite the small size of holdings smallholder cropping patterns include 11 dominant crops and 65 distinct mixtures.

Coconuts and Cocoa

2.15 Maintenance standards in the survey area are high, with plots brushed at least to shoulder height, and most plots brushed to ground level. In the survey the coconut variety is local tall and stands are mostly in the age group 9 - 40 years, with some young plantings.

2.16 50% of cocoa plantings (3 plots) are aged 6 - 25 years and 50% are less than 5 years. In fact all plots are young and little cocoa production takes place among sampled households at this stage.

Fallow

2.17 Fallow in Solomon Islands farming systems is necessary for the maintenance of soil fertility, particularly for the replenishment of potassium in ash following burning. Shifting cultivation has other valuable characteristics, not least its phytosanitary qualities. The fallow period is an indicator of land pressure, and possible fertility and pest problems associated with intensive cultivation. On food gardens where it is known, there is a fallow period of 4.7 years, but 53% have a fallow longer than memory extending over 73% of the food garden area. Root crops are typically grown over 3 to 6 harvests before reverting to fallow.

2.18 80% of all gardens have a fallow of primary or secondary forest extending over 91% of the farmed area. Only 9% of food gardens are cut from primary forest, representing an insignificant area. 41% of tree gardens are cut from primary forest on 53% of the tree crop area.

2.19 In the survey there were cases of organic inputs applied to food gardens, but no purchased inputs of any kind.

Landform

2.20 All tree gardens, and almost all food gardens are on lowlands sites, mainly beach and lowland plain for tree gardens and plains, river channels and terraces for food gardens. The mean slope is only 1 degree, and few plots are recorded with slopes of greater than five degrees and to a maximum of 10 degrees.

2.21 The mean time taken to reach gardens is .332 hours or about 20 minutes, with a maximum time of 2.00 hours. The mean time taken to reach tree crop gardens from the household is .421 hours, with a maximum recorded time of 2.00 hours. The mean time taken to reach food gardens from the household is .300 hours, with a maximum time of 1.00 hours.

Adverse Factors Affecting Production

2.22 58% of gardens representing 73% of the cultivated area have no apparent site limitations. Poor soil and site facrors are regarded as constraints on 14% of gardens (16% of area); pests and disease are a problem on 22% of gardens (11% of area); weeds are a problem on 16% of gardens affecting 3% of the cultivated area.

Crop Yields

2.23 Production data from the farming systems survey need to be reinforced with further yield studies to be undertaken by AES in 1989 and beyond. Indicative yields derived from secondary sources are presented in chapter 14. In the survey the following yields were obtained:

Yield data from the farming systems survey

	# obs	kg/ha
Copra	6	428

Labour

2.24 73% of gardens on 54% of the farmed area have no important constraints, due to a high proportion of very small holdings and a small overall mean holding size. The dominant constraints are on tree crops, and the dominant constraints are labour and inputs and cash rather than distance of gardens from the household. A summary of constraints expressed as percentages of gardens by each crop type [and in brackets as the corresponding % area] is as follows:

limitation	<---------- garden type ---------->			
	tree crops		short term cash crops	food crops	
No limitation	53	[50]		81	[79]
Lack of labour	41	[44]		17	[21]
Lack of inputs	18	[9]		2	
Garden too far					

2.25 Labour expenditure on the average holding is summarised in table 2.1 - presented firstly by crop (aggregating all operations) and secondly by operation (aggregating all crops).

2.26 Overall men provide 36% of labour and women provide 61%, with 3% of farm labour accounted for by hired labour. There are 596 work days per year required on an "average" holding of which 216 are provided by men, 365 by women and 15 by hired labour. The average adult man in the household spends 109 days working on the holding and the average adult woman spends 207 days.

2.27 Coconuts account for 423 of the holding labour budget and sweet potato accounts for 68%.

2.28 Men and women share most operations. Of the annual labour budget of 596 days, land clearance accounts for 8% of labour expended, cultivation accounts for 5%, planting 9%, establishment and maintenance 21%, weeding or brushing 19% and harvesting 38%.

Table: 2.1
SUMMARY OF LABOUR INPUT

	work days per year per holding				per ha	% contribution			labour cost
	men	women	paid	total	average	men	women	paid	(I)
i) By Crop									
Cleared Land	2	1		3		67	33		
Coconut	95	33	12	140		68	24	9	9
Cocoa	34	7		41		83	17		
Grain Crops									
Cabbage									
Vegetable									
Sweet Potato	85	315	3	403		21	78	1	32
Taro					333				
Pana		2		2	2038		100		
Cassava		7		7	7071		100		
All Crops	216	365	15	596		36	61	3	41
ii) By Operation									
Land Clearance	32	12	1	45		71	27	2	10
Cultivation	28		2	30		93		7	13
Planting	14	37		51		27	73		2
Tree Crops Establishment	43		5	48		90		10	5
Tree Crops Maintenance	55	21	4	80		69	26	5	2
First Weeding	15	39		54		28	72		3
Second Weeding	13	41	3	57		23	72	5	6
Third Weeding	4	1		5		80	20		
Harvesting	12	214		226		5	95		
All Operations	216	365	15	596		36	61	3	41
Available labour units	1.99	1.76							
Days per unit labour	109	207	15						

Cash Crop Processing

2.29 Copra manufacture requires 109 work days per annum to produce 1,120kg copra, or one work day per 10kg copra produced. 88 work days are spent on picking and shelling the nuts which account for 81% of the total production time. Firewood collection takes 6 days or 6% of the time; and drying, bagging and transport take 15 days or 14% of the time.

2.30 From an annual production of 1,120kg valued at the prevailing price of 33 cents per kilo the gross return is SI$370. Inputs costs from bags, twine and labour amount to SI$17.42. The net income is SI$353 which, at a requirement of 108 household labour days, represents a net return to labour of SI$3.26 per household work day.

2.31 No cocoa production was recorded from sampled farmers.

Marketing

2.32 Sale volumes and prices are generally regarded as "average" with most sales taking place locally or to Gizo. Marketing problems are mostly related to transport problems and poor market facilities at Gizo. Local market prices were not available during the survey.

Chapter: 3
HOUSEHOLD COMPOSITION

3.1 The analysis of household composition in the farming systems survey is to set production and management information in a social context and to establish labour availability. New demographic data are becoming available from the 1986 census and these provide background to survey results. Table 3.1 summarises some early results of the census[1].

Table: 3.1
POPULATION CHARACTERISTICS
(from the 1986 census)

Province	Western	Ysabel	Central	Guadal	Honiara	Malaita	Makira	Temotu	Total
1986 population	55,250	14,616	18,457	49,831	30,413	80,032	21,796	14,781	285,176
annual growth rate	3.0	3.2	2.9	4.3	6.8	2.7	3.6	2.8	3.5
% national population	19	5	6	17	11	28	8	5	100
peri-urban population	3,710	1,901	1,622		30,413	3,252	2,588	1,295	44,781
% peri-urban	7	13	9	38		4	12	9	16
males	29,202	7,329	9,850	26,251	17,293	39,605	11,174	7,268	147,972
females	26,048	7,287	8,607	23,580	13,120	40,427	10,622	7,513	137,204
sex-ratio	112	101	114	111	132	98	105	97	108
number of households	7,942	2,362	3,079	8,072	4,317	12,417	3,278	2,375	43,842
household size	6.96	6.19	5.99	6.17	7.04	6.45	6.65	6.22	6.50
Age composition (%)									
0 - 14	46.4	48.8	45.7	46.8	39.2	50.2	50.7	49.6	47.3
15 - 29	27.2	22	26	27.2	35.7	21.7	23.3	23.3	25.8
30 - 44	13.5	13.9	14.4	14	17.1	13.2	13.1	13.3	13.9
45 - 59	8	8.5	8.2	7.3	5.8	9.1	8.2	8.5	8.1
60 +	4.9	6.7	5.7	4.6	2.1	5.7	4.6	5.5	4.9

Source: Statistics Office Statistical Bulletin 3/88

3.2 In November 1986 the population of Solomon Islands was 285,176 with an annual growth rate of 3.5%. The national mean household size was 6.5, resulting in a total of 43,842 households, of which at least 84% are rural. Guadalcanal, Malaita and Western Provinces account for 77% of the national population.

3.3 The age composition of the Solomon Islands population is young with a wide based, tapering population pyramid. The "dependency ratio" (the number of persons under 15 years and over 60 years of age per 100 persons aged 15 to 59 years) is 109[2].

3.4 The total fertility rate is 6.4 children per woman at the end of her child bearing age. The life expectancy at birth among males is 59.9 years, and among females is 61.4 years. Male infant mortality is 40 per thousand live births compared with a female infant mortality of 36 per thousand live births[2].

3.5 In the census 40,046 persons attended school during 1986, although some disruption was caused by Cyclone Namu. Among all persons aged 5 years and over not attending school in 1986, 51% had no education. Primary school attendance spans a wide age range, but 20% of age group 10 to 24 never attended school.

3.6 94.2% of the Solomon Islands population is Melanesian, 3.7% Polynesian and 2.1% other ethnic groups, but mainly Kiribati. 17% of the census population were residing in a province other than that of their birth, indicating a considerable level of internal migration. Onward movement is particularly strong from Malaita, resulting in net out-movement. This is true for provinces other than Central and Guadalcanal which experience a net in-movement. All provinces showed a net movement to Honiara.

3.7 Household composition results from the farming systems survey are summarised in table 3.2. Age categories are chosen to provide approximate conversion into "available labour units". The membership of a household often includes relatives and, less commonly, non-relatives (these are both referred to as "relatives" in the table). Both family and non-family members define the "de facto" household size which is the actual number of people residing in the household, and is illustrated in diagram 3.1. A second measure of household composition is the number of immediate family members (father, mother, sons and daughters) either living at home or living away. This is known as the "de jure" family size.

Table: 3.2
HOUSEHOLD COMPOSITION

Mean Number of Household Members:

MALE						FEMALE				
living at HOME			AWAY	AGE GROUP	living at HOME			AWAY	
Head	Family	Relative	Family		Head	Family	Relative	Family	
0.08				> 55		0.03			
0.85	0.62	0.18	0.23	16 - 55	0.03	1.35	0.10	0.05	
	0.93	0.05	0.08	6 - 15		0.87		0.03	
	0.45			2 - 5		0.28	0.05		
	0.05	0.03		0 - 1		0.03	0.03		total
Category total:	0.93	2.05	0.26	0.31	0.03	2.56	0.18	0.08	6.4(
Family at home:		2.98				2.59			5.5
De Facto total:			3.24				2.77		6.0
De Jure total :				3.29				2.67	5.9

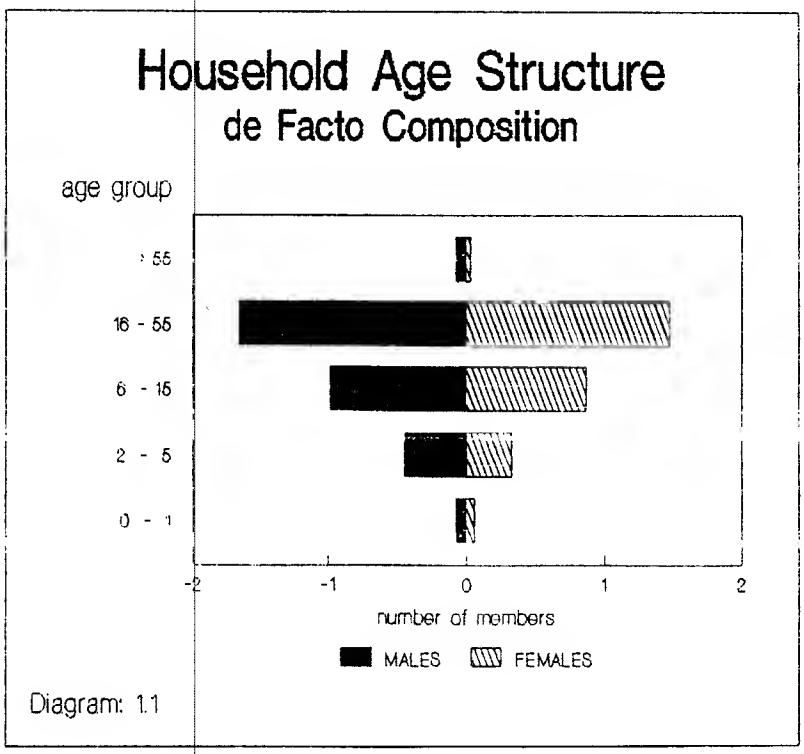


Diagram: 1.1

3.8 In the survey area the average family size is 5.96. With 7% of family members living away from home, a household has on average 6.01 members, of which 5.57 are immediate family and the remainder relatives or others residing in the household. Of the family members living away 0.28 are in the economically active age group 16 - 55 and 0.11 are younger than 15. Of 3.29 male family members 2.98 live at home, representing a net onward movement of 9% among male family members. This is not entirely compensated for by non-family male household members, since there are 3.24 males in the household.

3.9 Of 2.67 female family members 2.59 live at home, representing an onward movement of 3% . This is compensated for by additional non-family female members living in the household since there are 2.77 female members of the household.

3.10 There is then a 2% net outward movement of males and a 4% net inward movement of females. This results in a household gender composition of 3.24 male household members to 2.77 females, a ratio of 1:0.85 males to females.

3.11 Household composition is converted into "adult equivalent labour units" in table 3.3 according to factors employed by Bathgate[18] (although there are slight differences in age classes between the two studies). An average household of 3.57 labour units is made up of 1.99 male units and 1.76 female units, a ratio of 1:0.88 male to female labour units.

Table: 3.3
HOUSEHOLD LABOUR AVAILABILITY

Mean number of members by age group:

MALES			AGE GROUP	FEMALES			TOTAL		
de Jure	de Facto	labour		de Jure	de Facto	labour	de Jure	de Facto	labour
0.08	0.08	0.05	› 55	0.03	0.03	0.02	0.11	0.11	0.07
1.70	1.65	1.65	16 - 55	1.43	1.48	1.48	3.13	3.13	3.13
1.01	0.98	0.29	6 - 15	0.90	0.87	0.26	1.91	1.85	0.55
0.45	0.45		2 - 5	0.28	0.33		0.73	0.78	
0.05	0.08		0 - 1	0.03	0.06		0.08	0.14	
Total	3.29	3.24	1.99	2.67	2.77	1.76	5.96	6.01	3.75

Labour availability assumes the following conversion factors:

age class	factor
› 55	0.6
16 - 55	1.0
6 - 15	0.3
0 - 5	0.0

Chapter: 4
INCOME EARNING ACTIVITIES

4.1 2.5% of rural households in the country were enumerated in the 1982 Household Income and Expenditure Survey [3] conducted by the Statistics Office of the Ministry of Finance. Virtually all rural households had food gardens. **39%** sold copra and **41%** sold garden produce, with an average monthly income from sales of **SI$ 56**. A summary of income earning activities according to the 1982 survey compared with the 1986 population census is presented in table 4.1.

Table: 4.1
1982 INCOME AND EXPENDITURE SURVEY: SALES

activity	% households earning income	
	1982	1986
copra	39	29
coconut	18	
cocoa	0.38	9
betel nut	1.25	17
other cash crop	12	
garden produce	41	34
cattle		2
pigs		12
poultry		10
fish	24	17
crabs, lobster		4
beche de mer		12
shells	7	
carvings	4	
hand crafts	0.38	4
canoes		3
mats, baskets		10
thatch		4
houses		5
other sales	1.13	

Source: Statistics Office National Accounts Discussion Document No 2
Statistics Office Bulletin 12/88

4.2 These figures show the importance of garden produce sales as an income earning activity, although the relative magnitude of earnings is not known. Copra is the major cash earning commodity, showing an apparent contraction in the proportion of rural sales. Cocoa sales have, in contrast, expanded.

4.3 In the 1982 survey **27%** of rural households had at least one member in paid employment, from which the average monthly wage was **SI$103**. **16%** had their own business and **39%** of households had a share in a cooperative (although it is stated that this result should be treated with caution). **10%** of households held a loan, with an average monthly repayment of **SI$87**.

4.4 On average a household spent **SI$57** per month on goods and services of which **47%**, or **SI$27**, was on food. Less frequent expenditures amounted to **SI$5** per month.

4.5 Reported (cash and non-cash) income was **SI$147** compared to monthly expenditures of **SI$131**. The average cash component of income amounted to **SI$86** per month compared with expenditures of **SI$74**. The excess of **17%** in income over expenditure was believed to be due to the underestimation of production costs rather than the true value of rural savings.

4.6 The 1986 census [2] found that **25%** of the population aged 14 years and over was working for money (the week before the census enumeration), and about half of those also performed village work such as track clearing and church construction. About **80%** of those not engaged in cash employment performed village work.

4.7 **35%** of males were engaged in cash employment compared with **13%** of females. The 1982 Household Income and expenditure survey also states that "generally boys had a better chance of attending school than girls".

4.8 The rural economy is diverse, with a variety of farm and off-farm activities which contribute to household income. Results from the farming systems survey are presented in table 4.2. The table describes the proportion of households undertaking income earning activities in the survey area. Rural income and expenditure patterns are covered by other (non AES) surveys - planned or recently undertaken - and so the present survey does not investigate the relative importance of activities undertaken in terms of income earned, except in Chapter 19 on marketing.

Table: 4.2

INCOME EARNING ACTIVITIES

	(---- % households ---- by activity individual	group	summary of individual activities
Households Earning Income Over the Past Year From:			
COCONUTS			
Coconuts	15	20	+++++++
Copra	48	53	++++++++++++++++++++++
Coconuts and Copra	5		++
Total	68		
COCOA			
Wet beans	5	5	++
Dry Beans	3	3	+
Wet and Dry Beans			
Total	8		
OTHER CROPS			
Food Crops	53	65	++++++++++++++++++++++++
Other Cash Crops	3	13	+
Food and Cash Crops	10		+++++
Livestock		3	
Food crops and Livestock	3		+
Cash Crops and Livestock			
Food, Cash Crops and Livesock			
Total	68		
FISHING			
Fish	30	30	+++++++++++++++
Shellfish			
Fish and shellfish			
Crabs, etc			
Fish and Crabs			
Shellfish and Crabs			
Fish, Shellfish and Crabs			
Total	30		
LOGGING/MINING			
Logging			
Sawmill			
Logging and Sawmill			
Mining			
Logging and Mining			
Sawmill and Mining			
Logging, Sawmill and Mining ..			
Total			

INCOME EARNING ACTIVITIES (continued)

	(---- % households by activity ---- individual	group	summary of individual activities
PROFESSION			
Teacher	5	5	++
Government Employee	5	5	++
Other Profession			
Total	10		
COOPERATIVE			
Crop Production Cooperative ..	3	5	+
Marketing Cooperative	3	3	+
Crop and Marketing			
Cooperative Shop	5	8	++
Crop and Shop	3		+
Marketing and Shop			
Crop, Marketing and Shop			
Total	13		
BUSINESS			
Private shop	5	5	++
Vehicle Hire			
Shop and Vehicle			
Crafts			
Shop and Crafts			
Vehicle and Crafts			
Shop, Vehicle and Crafts			
Total	5		
SKILLED TRADE			
Joiner/housebuilder	5	5	++
Mechanical Trade			
Joiner and Mechanical			
Other Skilled Trade	3	3	+
Joiner and Other			
Mechanical and Other			
Joiner, Mechanical and Other .			
Total	8		

4.9 In the table are two columns, entitled "individual" and "group". Individual activities distinguish between combinations of activities - treating for instance "food crops" (only), "livestock" (only) and both "food crops and livestock" as three distinct activities. The percentages of households for individual activities are additive, and are shown as a "total" for each set of related activities in the table.

4.10 Under group activities - all occurrences of "food crops" and all occurrences of "livestock" are summarised under the two main headings, since "livestock" and "food crops and livestock" are both livestock activities. "Group" activities represent an alternative summary for the data set, and are non additive.

4.11 To the right of table 4.2 is a histogram summary of individual activities. Diagram 4.1 provides a visual summary of grouped activities.

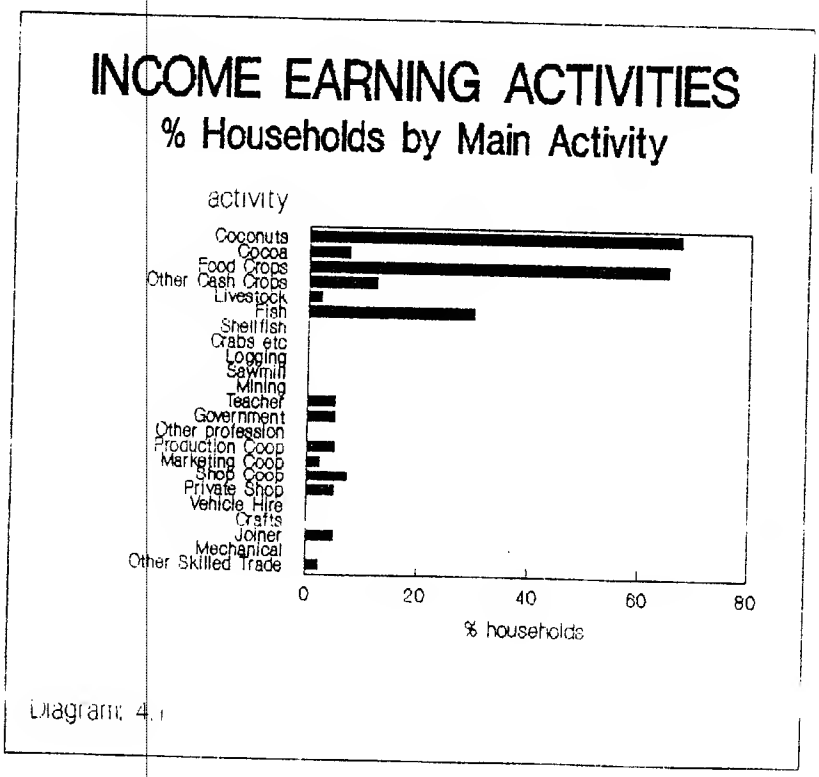


Diagram 4.1

4.12 Agricultural income earning activities in the survey area are predominantly the sale of copra, food crops and fishing. **68%** of sampled households earn income from copra sales and **65%** earn income from food crops. **13%** of households earn income from minor cash crops and **3%** from livestock. **30%** of households earn income from fish, but not from shellfish or crabs of any kind due to the strong influence of the Seventh Day Adventist Church.

4.13 **10%** of households earn income from a profession, in teaching or government service. **5%** of households have a business and **8%** have a skilled trade.

Chapter: 5
EXTENSION AND MASS MEDIA

5.1 Table 5.1 summarises the penetration of mass media and extension in the survey area.

Table: 5.1
EXTENSION AND MASS MEDIA

	% households	summary
i) Households Listening to Agricultural Programmes on the Radio:		
Never listen	45	++++++++++
Listen weekly	23	+++++
" monthly	5	+
" occasionally	28	++++++
Total	100	
ii) Households with Members who can Read and Write:		
Not able to read or write		
Able to read		
" write		
" read and write	100	++++++++++++++++++++++++++
	100	
iii) Households Visited by (any type of) Extension Worker:		
Never been visited	83	++++++++++++++++++++
Visited very occasionally	3	.
" once per year	10	++
" " " 6 months		
" " " 3 months		
" " " month		
" " " week		
Don't know	5	+
	100	
iv) Households in which Members have Attended Training:		
Never attended training	83	++++++++++++++++++++
Attended village meeting		
" day course at training centre		
" village meeting and day course	3	.
" residential course	15	+++
" village meeting and residential course		
" day and residential course		
" village meeting, day and residential course		
	100	
	100	

5.2 Travel and communication are difficult in Solomon Islands, with scattered islands of low population densities. Radio offers a means of transmitting information throughout the country, albeit one-way, and in a medium which makes few demands on literacy. In the survey 55% of households listen to agricultural programmes on the radio, but only half listen on a regular basis. The communication of agricultural and other development information by radio may be extended further by word of mouth.

5.3 The second part of the table shows the proportion of households in which at least one member is able to read or write. According to these results 100% of households have at least one member with some reading and writing skills. The survey was unable to verify the level of skills or to substantiate this finding objectively, but the result suggests that simple written materials are an appropriate extension medium. In more general terms, pictural materials would be popular together with simple text and annotation.

5.4 The frequency of extension visits is investigated in the third part of the table, and is illustrated in diagram 5.1.

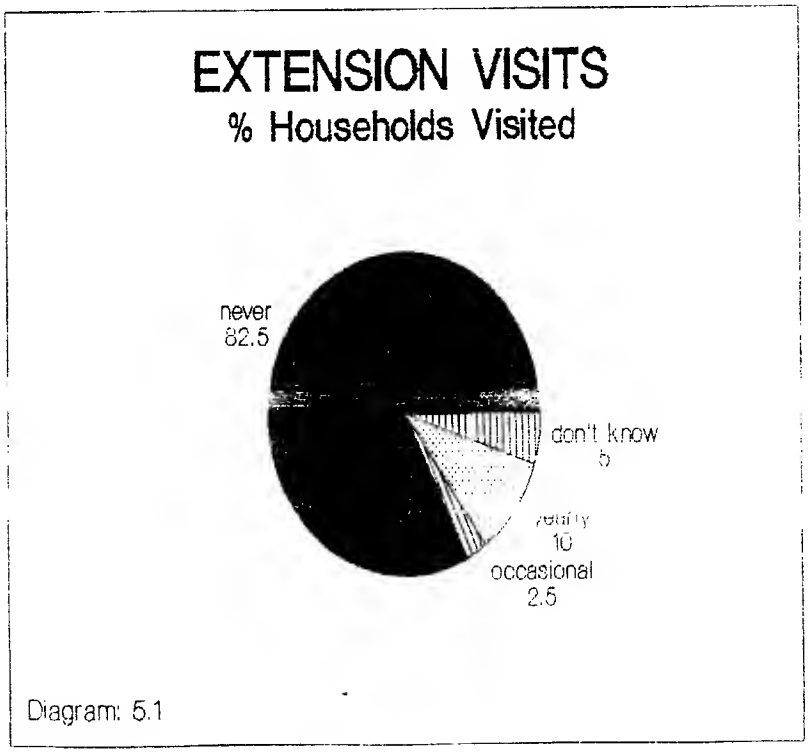


Diagram: 5.1

5.5 Extension in the present study refers to any agricultural worker in government extension, research, NGOs or other organisations. 13% of households have been visited by extension, but only infrequently, and 18% have received some form of agricultural training.

Chapter: 6
LIVESTOCK

6.1 Livestock, particularly small stock such as pigs and chickens, are an important feature of smallholder agriculture in Solomon Islands.

6.2 The number of cattle in the 1985 census was 19,750 - a fall of 13.1% from 1984 due largely to destocking in the plantation sector. Overall the national herd was 22% below its peak of 1978, with an average annual fall of 3.4% [4].

6.3 The smallholder sector accounted for 7,612 cattle, 39% of the national herd, showing a decline of 4.1% from the 1984 census. The distribution of cattle throughout the country is shown in table 6.1.

Table: 6.1
CATTLE DISTRIBUTION IN 1985

Province	total cattle	% distribution
Western	4,841	25
Ysabel	1,110	6
Central	2,081	10
Guadalcanal	6,292	32
Malaita	3,810	19
Makira	1,462	7
Temotu	217	1
Total	19,750	100

Source: Statistics Office, 1985 Cattle Census

6.4 In the 1982 Income and Expenditure Survey [3] it was found that 37% of households owned pigs, 30% owned chickens, but only 8% owned cattle. The provincial breakdown is shown in table 6.2.

6.5 According to the 1986 Population Census [2] 2% of households earned income from cattle, 12% earned income from pigs and 10% earned income from poultry.

Table: 6.2
LIVESTOCK DISTRIBUTION IN 1982

Province	% households owning		
	cattle	pigs	chickens
Western	2	19	24
Ysabel	42	25	47
Central		28	7
Guadalcanal	2	63	41
Malaita	9	35	28
Makira	10	69	63
Temotu		40	4
Total	8	37	30

Source: Statistics Office, 1982 HH Income and Expenditure Survey

6.6 3% of households earned income from livestock (table 4.2) sales.

6.7 Table 6.3 summarises livestock ownership in the survey area, and is divided into three columns. The first, entitled "ownership %", specifies the percentage of households which own livestock. The middle two columns show mean stock held: firstly among livestock owning households (owners); and secondly as an average of all farmers in the survey area (both owners and non-owners). To the right of the table is a histogram summary of ownership based on the mean among all farmers.

6.8 The table is divided horizontally into three main parts. The first part specifies stock numbers kept predominantly for home use, but which may include occasional sales. The second part specifies stock numbers where livestock comprise an income earning enterprise. The third part is the overall mean of livestock ownership irrespective of type of enterprise. (Note that overall mean ownership figures are derived from the original data and may not be obtained from summation of the table entries above).

6.9 At the foot of the table is a component on novel livestock enterprises, such as bees, butterflies and crocodile farming, however, these were not encountered in the survey.

Table: 6.3

LIVESTOCK

Livestock Ownership:

	ownership %	<-- mean ownership among --> owners	all farmers	summary all farmers
i) Home Use				
Cattle				
Pigs				
Goats				
Chickens	30	9.92	2.98	++++++++++
Ducks	3	3.00	0.08	.
Horses				
ii) Commercial				
Cattle	3	2.00	0.05	.
Pigs				
Goats				
Chickens	8	9.00	0.68	++
Ducks				
Horses				
iii) Total				
Cattle	3	2.00	0.05	.
Pigs				
Goats				
Chickens	38	9.73	3.66	++++++++++++++
Ducks	3	3.00	0.08	.
Horses				

iv) Households Earning Income	<---- % households by activity ----> individual	group
Income from:		
1. Bees or honey		
2. Butterflies		
3. Bees and Butterflies		
4. Crocodiles		
5. Bees and crocodiles		
6. Butterflies and crocodiles		
7. Bees, butterflies and crocodiles		

6.10 Livestock in small numbers, particularly chickens, are a feature of smallholder agriculture in Simbo. Few cattle are kept but Kolombangara is unusual for the absence of pigs, normally the most important element of livestock in Solomon Islands.

6.11 No sampled household had pigs largely due to the very strong influence of the Seventh Day Adventist Church on Kolombangara.

6.12 Chickens are kept mainly for family consumption, and are the most important form of livestock. They are generally allowed to free range, requiring minimal management. Chickens are kept by 38% of sampled households with a mean flock size of 9.73 among owners.

Chapter: 7
HOLDING SIZE DISTRIBUTION

7.1 Holding size distribution is of interest because it provides an understanding of the structure of agriculture and may help to explain constraints faced by farmers or response to services.

7.2 Table 7.1.i describes the holding size distribution of the survey area. One sampled household has no cultivated land ans is excluded from the analysis. Holdings are in general small and a high proportion of farmers have very small areas, with a mean holding size of **0.948ha**. This can be seen in diagram 7.1 which shows that inequality in the holding size distribution arises largely because a high proportion of farmers fall in the very low holding size class of 0 to 0.25ha while a small proportion of farmers account for a disproportionate part of the farmed area.

7.3 The mean describes the "average" holding size and is of interest in that it provides a value for the "middle" of the data based on the spread of values, but it may be misleading when unbalanced extreme values occur. Another measure of central tendency is the median which is the "mid-point" in the data, the value of the middle item when the data are arranged in order. In a "normal distribution" the median and the mean coincide. The median in this case is **0.165ha** which is close to the mean holding size.

7.4 An indicator of variability is the range, which is derived from extremes in the data. The minimum area is **0.013ha** and the maximum is **9.595ha**, a wide range of **9.552ha**.

7.5 The standard deviation is a measure of variation based on the extent to which values deviate from the mean. If the data are closely bunched the standard deviation is small, and if they are widely spread it is large. In a normal distribution 68% of values lie within 1 standard deviation on either side of the mean, and 95% within 2 standard deviations. In the survey results the mean of **0.948ha** has a standard deviation of **1.997** and a very high coefficient of variation of **211%** (the standard deviation expressed as a percentage of the mean).

7.6 Skewness is an index of symmetry in the data. A normal distribution is symmetrical about the mean, with a skewness coefficient of zero, whereas a skewed distribution has a longer "tail" on one side than the other. The present data have a skewness of 3.476 indicating positive skewness.

7.7 Kurtosis is the extent to which the data cluster around a central point. When this occurs the distribution appears "peaked". Positive values of kurtosis indicate that the distribution is more peaked than normal. In the present data set has a high coefficient of kurtosis of 12.424.

7.8 There is a high level of inequality in holding size distribution, where a high proportion of farmers have very small holdings while a few have relatively large holdings. The holding size distribution may be viewed in standard form in diagram 7.2. The diagonal represents the holding size distribution for equality and the curve below represents the actual (cumulative) holding size distribution. The area between the diagonal and the curve is the "area of inequality". The larger the area of inequality, the more unequal the holding size distribution. This may be expressed as an index, called the "Gini coefficient", which is the area between the two lines expressed as a proportion of the area of the triangle below the diagonal. The Gini coefficient ranges from 0 (for perfect equality) to 1 (for perfect inequality). The Gini coefficient here is 0.731, indicating a high degree of inequality.

Table: 7.1
HOLDING SIZE DISTRIBUTION

i) All holdings and all crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	(------- % --------) holdings	area	(-- cumulative % --) holdings	area
0 - .25	23	0.1088	2.50	59	7	59	7
.25 - .5	2	0.3002	0.60	5	2	64	8
.5 - .75	4	0.5380	2.15	10	6	74	14
.75 - 1						74	14
1 - 1.25	2	1.1111	2.22	5	6	79	20
1.25 - 1.5	2	1.2830	2.57	5	7	85	27
1.5 - 1.75	1	1.5125	1.51	3	4	87	31
1.75 - 2						87	31
2 - 2.5	1	2.2639	2.26	3	6	90	37
2.5 - 3	1	2.5170	2.52	3	7	92	44
3 - 5	1	3.0305	3.03	3	8	95	52
5 - 10	2	8.8067	17.61	5	48	100	100
10 - highest						100	100
Total	39	0.9482	36.98	100	100		

Mean	0.948	S.E. Mean	0.320
Median	0.165	Coef. of Var %	211
Std Dev	1.997	Variance	3.989
Kurtosis	12.424	S.E. Kurtosis	0.741
Skewness	3.476	S.E. Skewness	0.378
Range	9.552	Minimum	0.013
Maximum	9.565	Sum	36.980
Gini	0.731		

Note that the main table is a frequency distribution of grouped intervals, while the statistics at the foot of the table describe the ungrouped data set.

HOLDING SIZE DISTRIBUTION

all holdings - all crops

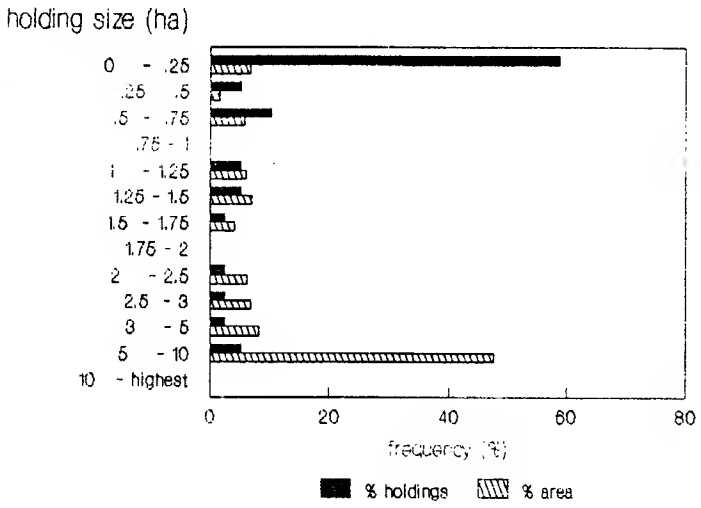


Diagram 7.1

LORENZ CURVE

all holdings - all crops

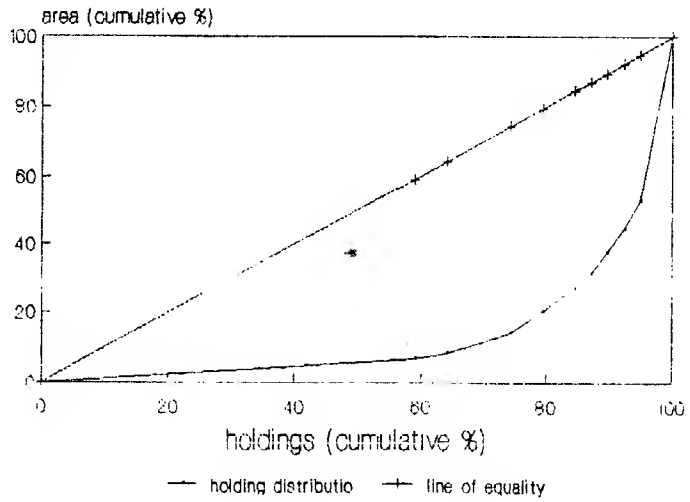


Diagram 7.2

7.9 Table 8.1.ii shows the holding size distribution of only those farmers who have tree crops. The sample is reduced from 39 to 15, and so the stratum of farmers with tree crops represents **38%** of farmers in the sample. This is appreciably lower than the **68%** of farmers which stated copra and coconuts to be income earning activities (chapter 4). The **30%** difference is accounted for as follows:

2.5% - trade coconuts to make copra
12.5% - use the coconuts from relatives to make copra
15.0% - have leased plantings on alienated land in North Kolombangara (not included in the survey)

7.10 The mean holding size among tree cropping farmers is **2.254ha** and the median is **1.279ha**. The coefficient of skewness and kurtosis have been reduced but but the range remains high. The majority of very small holdings are excluded, the mean holding size is increased and the distribution is less scattered with a coefficient of variation of **124%**.

ii) Holdings with tree crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	⟨------- % --------⟩ holdings	area	⟨-- cumulative % --⟩ holdings	area
0 - .25	1	0.1590	0.16	7	0	7	0
.25 - .5	1	0.3244	0.32	7	1	13	1
.5 - .75	3	0.5359	1.61	20	5	33	6
.75 - 1						33	6
1 - 1.25	2	1.1111	2.22	13	7	47	13
1.25 - 1.5	2	1.2830	2.57	13	8	60	20
1.5 - 1.75	1	1.5125	1.51	7	4	67	25
1.75 - 2						67	25
2 - 2.5	1	2.2639	2.26	7	7	73	32
2.5 - 3	1	2.5170	2.52	7	7	80	39
3 - 5	1	3.0305	3.03	7	9	87	48
5 - 10	2	8.8067	17.61	13	52	100	100
10 - highest						100	100
Total	15	2.2544	33.82	100	100		

Mean	2.254	S.E. Mean	0.723
Median	1.279	Coef. of Var %	124
Std Dev	2.800	Variance	7.838
Kurtosis	3.473	S.E. Kurtosis	1.121
Skewness	2.061	S.E. Skewness	2.061
Range	9.406	Minimum	0.159
Maximum	9.565	Sum	33.817
Gini	0.544		

7.11 The new distribution of farmers with tree crops is illustrated in diagram 7.3, and its associated Lorenz curve in diagram 7.4. Inequalities have been slightly reduced by excluding the smaller holdings and the holding size distribution is more uniform but still with a high Gini coefficient of **0.544**.

HOLDING SIZE DISTRIBUTION

holdings with tree crops

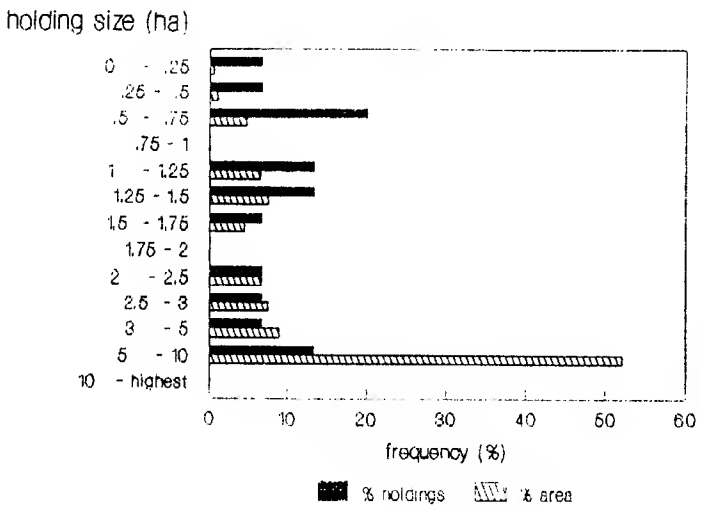


Diagram: 7.3

LORENZ CURVE

holdings with tree crops

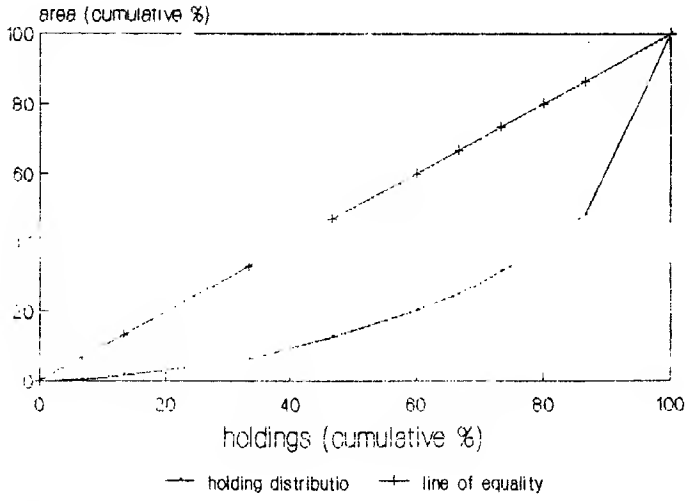


Diagram: 7.4

7.12 The corresponding stratum of farmers with no tree crops is shown in table 7.1.iii. 15 farmers, or **62%** of the sample have no tree crops. The mean holding size is **0.132ha** and the median is **0.106**. The range is small because there are now no large holdings. Skewness and kurtosis are, however, high. The distribution has a coefficient of variation of **82%**.

7.13 The holding size distribution is illustrated in diagram 7.5, and its associated Lorenz curve in diagram 7.6. Inequality is low with a Gini coefficient of **0.330**.

iii) Holdings without tree crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	(------- % --------) holdings	area	(-- cumulative % --) holdings	area
0 - .1	12	0.0656	0.79	50	25	50	25
.1 - .2	9	0.1481	1.33	38	42	88	67
.2 - .3	2	0.2497	0.50	8	16	96	83
.3 - .4						96	83
.4 - .5						96	83
.5 - .6	1	0.5444	0.54	4	17	100	100
.6 - .7						100	100
.7 - .8						100	100
.8 - .9						100	100
.9 - 1						100	100
1 - 1.5						100	100
1.5 - 2						100	100
2 - highest						100	100
Total	24	0.1318	3.16	100	100		

Mean	0.132	S.E. Mean	0.022
Median	0.106	Coef. of Var %	82
Std Dev	0.108	Variance	0.012
Kurtosis	8.819	S.E. Kurtosis	0.918
Skewness	2.573	S.E. Skewness	0.427
Range	0.531	Minimum	0.013
Maximum	0.544	Sum	3.164
Gini	0.330		

Note the smaller size classes in this table with respect to previous tables.

HOLDING SIZE DISTRIBUTION

holdings without tree crops

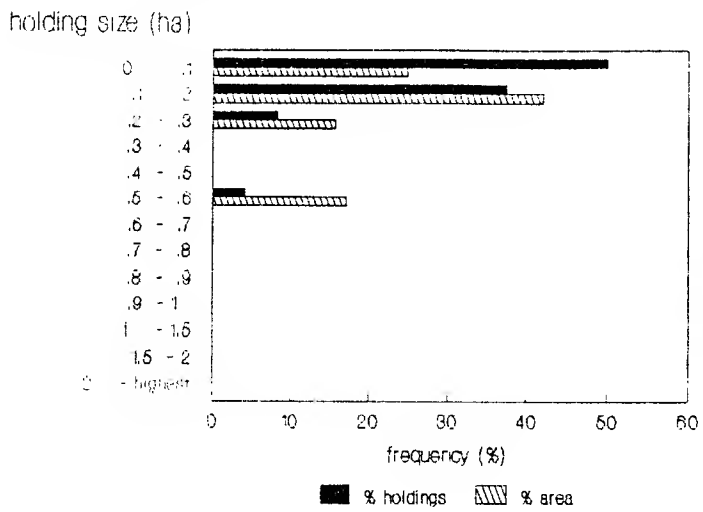


Diagram: 7.5

LORENZ CURVE

holdings without tree crops

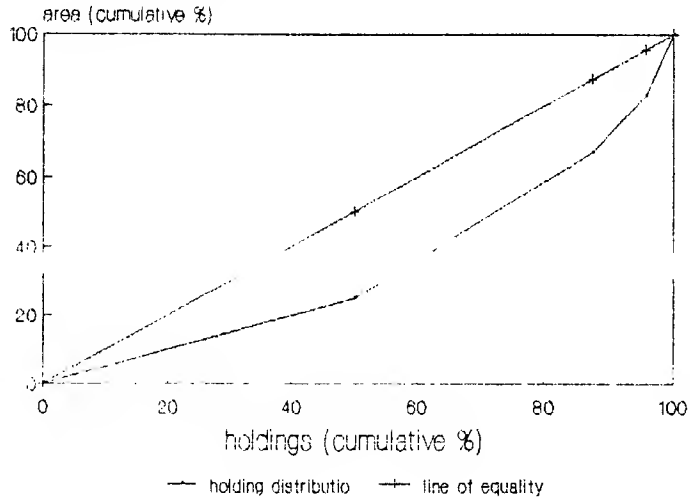


Diagram: 7.6

7.14 Table 7.1.iv describes the holding size distribution of all farmers, but excluding tree crop areas. The holding size distribution is illustrated in diagrams 7.7 and 7.8. These results are similar to those for non-tree crop farmers, indicating that subsistence cropping is similar among all farmers with a mean area of **0.120ha**.

iv) All holdings - total area excluding tree crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	⟨------- % --------⟩ holdings	area	⟨-- cumulative % --⟩ holdings	area
0 - .1	22	0.0567	1.25	56	27	56	27
.1 - .2	11	0.1506	1.66	28	35	85	62
.2 - .3	5	0.2499	1.25	13	27	97	88
.3 - .4						97	88
.4 - .5						97	88
.5 - .6	1	0.5444	0.54	3	12	100	100
.6 - .7						100	100
.7 - .8						100	100
.8 - .9						100	100
.9 - 1						100	100
1 - 1.5						100	100
1.5 - 2						100	100
2 - highest						100	100
Total	39	0.1205	4.70	100	100		

Mean	0.120	S.E. Mean	0.016
Median	0.095	Coef. of Var %	85
Std Dev	0.102	Variance	0.010
Kurtosis	6.700	S.E. Kurtosis	0.741
Skewness	2.106	S.E. Skewness	0.378
Range	0.531	Minimum	0.013
Maximum	0.544	Sum	4.698
Gini	0.360		

HOLDING SIZE DISTRIBUTION

all holdings excluding tree crops

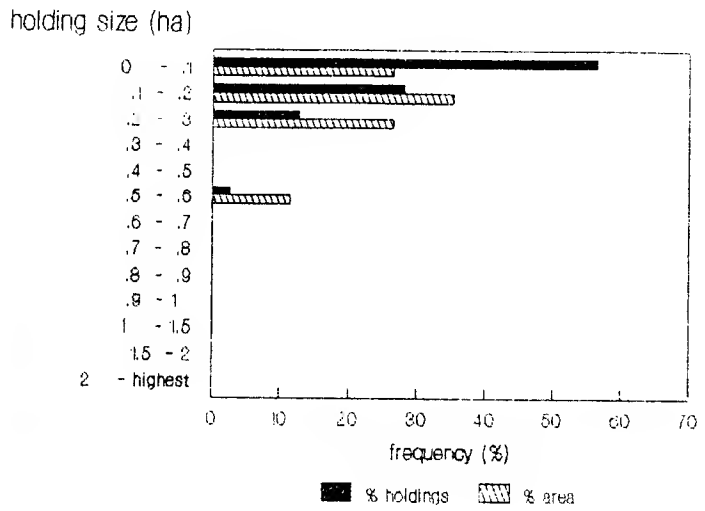


Diagram: 7.7

LORENZ CURVE

all holdings excluding tree crops

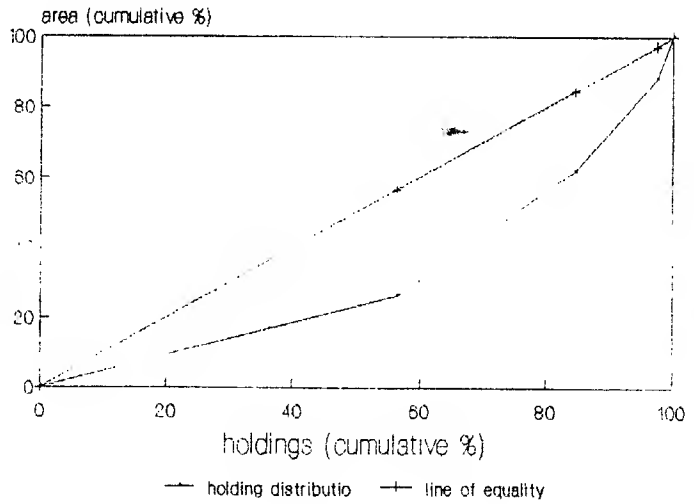


Diagram: 7.8

7.15 Table 7.1.v describes the size distribution of tree crop areas, illustrated in diagrams 7.9 and 7.10.

v) All holdings - total area of tree crops only

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	(------- % --------) holdings	area	(-- cumulative % --) holdings	area
0 - .25	2	0.1833	0.37	13	1	13	1
.25 - .5	2	0.4510	0.90	13	3	27	4
.5 - .75	1	0.5250	0.53	7	2	33	6
.75 - 1	2	1.0000	2.00	13	6	47	12
1 - 1.25	2	1.2141	2.43	13	8	60	19
1.25 - 1.5	1	1.5000	1.50	7	5	67	24
1.5 - 1.75						67	24
1.75 - 2	1	2.0000	2.00	7	6	73	30
2 - 2.5	1	2.4444	2.44	7	8	80	38
2.5 - 3	1	2.8329	2.83	7	9	87	46
3 - 5						87	46
5 - 10	2	8.6422	17.28	13	54	100	100
10 - highest						100	100
Total	15	2.1522	32.28	100	100		

Mean	2.152	S.E. Mean	0.713
Median	1.214	Coef. of Var %	128
Std Dev	2.760	Variance	7.620
Kurtosis	3.454	S.E. Kurtosis	1.121
Skewness	2.072	S.E. Skewness	0.580
Range	9.147	Minimum	0.137
Maximum	9.284	Sum	32.284
Gini	0.560		

7.16 Indicators of variability are moderately high indicating that variability in holding size is largely accounted for by differences in holding size between tree cropping and non-tree cropping farmers, and a high degree of variability between the area of tree crop plantings.

HOLDING SIZE DISTRIBUTION

all holdings - tree crops only

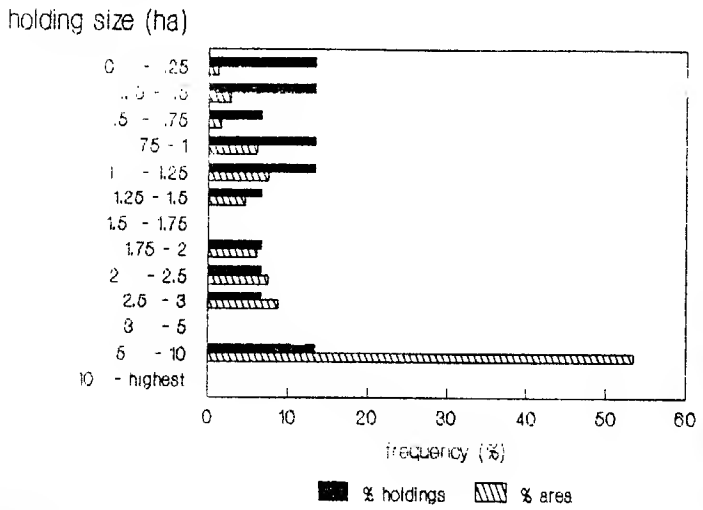


Diagram: 7.9

LORENZ CURVE

all holdings - tree crops only

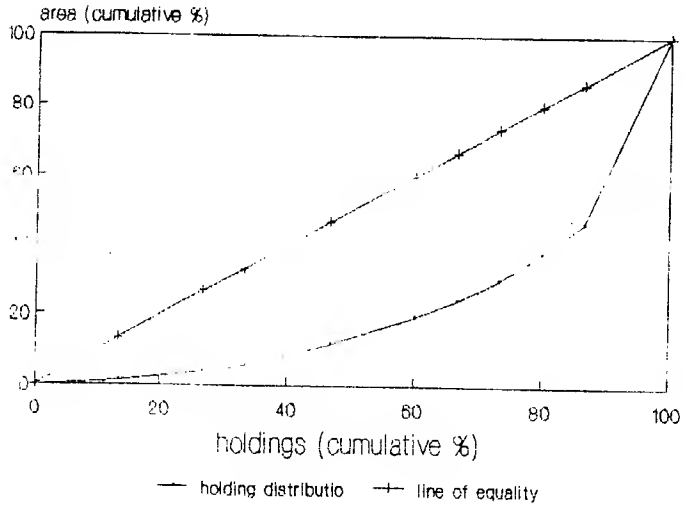


Diagram: 7.10

Chapter: 8
LABOUR DENSITY

8.1 According to Bathgate[18] "increments in the population of a household do not result in an expansion in the garden area. Instead, the garden area holds constant and ... the actual area per consumption and labour unit decreases ... Although there is a variation ... the average household ... tends to clear a fairly similar amount of land for gardens and plant a similar area of root crops". Bathgate postulates that there is no relationship between household size and food garden area. Larger family sizes are not then associated with larger holdings, and he attributes this to a tendency among subsistence producers to cultivate in excess of household requirements as insurance against crop failure.

8.2 In the present survey the area of food crops is found to be relatively constant in comparison to a variabile tree crop area. Table 8.1 shows the relationship between holding size and labour availability.

Table: 8.1
LABOUR DENSITY - ALL HOLDINGS

holding size class (ha)	units of labour	mean holding area (ha)	labour density (labour/ha)	number of observations
all holdings	3.78	0.95	3.99	39
< .25	3.99	0.11	36.68	23
.25 - .5	3.95	0.30	13.16	2
.5 - .75	3.50	0.54	6.51	4
.75 - 1				
1 - 1.25	4.60	1.11	4.14	2
1.25 - 1.5	2.45	1.28	1.91	2
1.5 - 1.75	2.30	1.51	1.52	1
1.75 - 2				
2 - 2.5	3.20	2.26	1.41	1
2.5 - 3	2.60	2.52	1.03	1
3 - 5	4.20	3.03	1.39	1
5 - 10	3.75	8.81	0.43	2
> 10				

8.3 There is no apparent relationship between holding size and available labour. Results are in agreement with Bathgate's findings since labour density falls rapidly from 36.68 adult units per hectare for the smallest holding class (less than 0.25ha) to 0.43 units in the largest (5-10ha) class. Small holdings then have a very high labour density while the larger holdings have a low labour density, as seen in diagram 8.1.

8.4 Labour densities are high on small holdings and with a mean of 3.99 labour units per hectare, labour is likely to be limiting only on larger holdings.

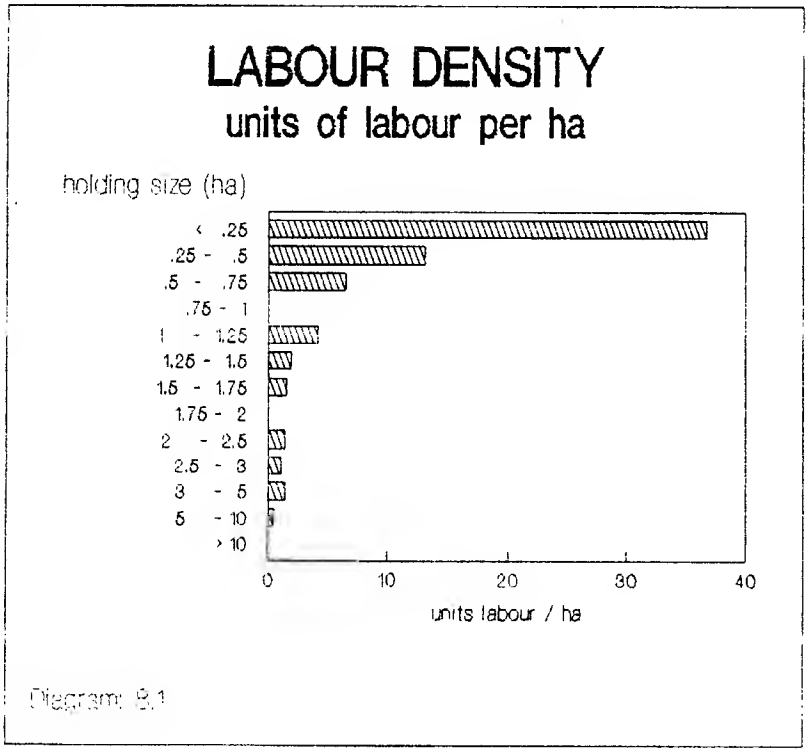


Diagram 8.1

8.5 Holdings without tree crops are shown in table 8.2.

Table: 8.2
LABOUR DENSITY - NON-TREE CROP HOLDINGS

holding size class (ha)	units of labour	mean holding area (ha)	labour density (labour/ha)	number of observations
all holdings	4.10	0.13	31.08	24
< .25	4.04	0.11	37.90	22
.25 - .5	3.90	0.28	14.14	1
.5 - .75	5.60	0.54	10.29	1
.75 - 1				
1 - 1.25				
1.25 - 1.5				
1.5 - 1.75				
1.75 - 2				
2 - 2.5				
2.5 - 3				
3 - 5				
5 - 10				
> 10				

8.6 The range of holding size is much smaller and the mean labour density is **31.08** labour units per hectare. The largest holdings of up to 0.75ha in size have a labour availability of **10.29** units per hectare. All holdings then have a very high labour density.

8.7 Holdings with tree crops are shown in table 8.3.

Table: 8.3
LABOUR DENSITY - TREE CROP HOLDINGS

holding size class (ha)	units of labour	mean holding area (ha)	labour density (labour/ha)	number of observations
all holdings	3.29	2.25	1.46	15
< .25	3.00	0.16	18.87	1
.25 - .5	4.00	0.32	12.33	1
.5 - .75	2.80	0.54	5.22	3
.75 - 1				
1 - 1.25	4.60	1.11	4.14	2
1.25 - 1.5	2.45	1.28	1.91	2
1.5 - 1.75	2.30	1.51	1.52	1
1.75 - 2				
2 - 2.5	3.20	2.26	1.41	1
2.5 - 3	2.60	2.52	1.03	1
3 - 5	4.20	3.03	1.39	1
5 - 10	3.75	8.81	0.43	2
> 10				

8.8 There is again little or no apparent relationship between holding size and labour availability. The mean labour density is 1.46 units per hectare, falling off from 18.87 units per hectare on the smaller holdings to 0.43 units per hectare on holdings of 5 to 10ha in size.

Chapter: 9
CROPPING PATTERNS

9.1 A "holding" is taken here to be the total area cultivated by a household. It includes all crops growing and land cleared, but does not include fallow which the family may have rights to cultivate.

9.2 A holding is divided into one or more "gardens", which are contigucus blocks of land growing similar crops. Only broad distinctions are made among crop types in gardens.

9.3 A garden may be subdivided into "plots" which are blocks within each garden growing a different crop mix, under different management, or planted at different times. Within plots detailed crop mixtures are recorded.

9.4 Table 9.1 describes cropping patterns at the garden level, maintaining the distinction between farmers with tree crop gardens and those without. A tree crop garden is taken to be a garden in which one or more plots have coconut or cocoa as the dominant crop.

9.5 Tree crop farmers have a mean holding size of **2.25ha**, of which **2.15ha** is tree crops and **0.10ha** food crops. In contrast, non-tree crop farmers have a mean holding size of **0.13ha**.

9.6 Tree cropping farmers tend to have more complex holdings, with an average of **2.53** gardens and **4.66** plots compared with **1.08** gardens and **3.58** plots among non-tree crop farmers.

9.7 Table 9.2 describes cropping patterns in more detail. This is derived from the aggregation of plot information in which complex mixtures are summarised by the dominant crop.

9.8 **11** major crop mixture classes are listed in table 9.2, predominantly coconuts, cocoa and root crops.

Table: 9.1
CROP COMPOSITION

i) All holdings

crop category	mean area in holding (ha)	mean no gardens per holding	mean no plots per holding	mean no plots per garden	summary of crop area
cleared land					
tree crops	0.83	0.44	0.44	1.00	++++++++
short term cash crops					
food crops	0.12	1.21	3.56	2.94	+
total	0.95	1.65	4.00	2.42	

number of observations = 39

ii) Holdings with tree crops

crop category	mean area in holding (ha)	mean no gardens per holding	mean no plots per holding	mean no plots per garden	summary of crop area
cleared land					
tree crops	2.15	1.13	1.13	1.00	++++++++++++++++++++
short term cash crops					
food crops	0.10	1.40	3.53	2.52	+
total	2.25	2.53	4.66	1.84	

number of observations = 15

iii) Holdings without tree crops

crop category	mean area in holding (ha)	mean no gardens per holding	mean no plots per holding	mean no plots per garden	summary of crop area
cleared land					
tree crops					
short term cash crops					
food crops	0.13	1.08	3.58	3.31	+
total	0.13	1.08	3.58	3.31	

number of observations = 24

Table: 9.2
CROPPING PATTERNS

	main crop in mixture	all farmers		farmers with no tree crops		farmers with tree crops	
		area (ha)	%	area (ha)	%	area (ha)	%
a	Cleared Land	0.007	1	0.007	5	0.007	0
b	Coconut	0.481	51			1.251	55
c	Cocoa	0.027	3			0.071	3
z	Coconut and Cocoa	0.319	34			0.830	37
d	Pasture						
e	Grain Crops	0.001	0			0.001	0
f	Beans						
g	Cabbage	0.001	0			0.003	0
h	Vegetables	0.001	0	0.000	0	0.000	0
i	Spices						
j	Fruit Crops						
k	Fruit trees						
l	Banana						
m	Citrus trees						
n	Nut trees						
o	Sugar cane						
p	Food/building tree						
q	Tobacco						
r	Sweet Potato	0.108	11	0.121	91	0.088	4
s	Taro	0.000	0			0.000	0
t	Yam	0.001	0			0.001	0
u	Pana	0.002	0	0.003	2	0.001	0
v	Cassava	0.001	0	0.001	1	0.001	0
w	Other root crop						
	Total mean area (ha)	0.948		0.132		2.255	
	Number of households	39		24		15	

9.9 The dominant crops are coconuts, cocoa and root crops. Cropping patterns are illustrated in diagrams 9.1 to 9.3.

9.10 Table 9.2 is still a simplification of cropping patterns found in the field. Table 9.3 describes in more detail the crop mixtures grown by farmers. This no longer applies to a "model" holding but, in aggregate, detailed cropping patterns may be used to determine proportional areas under crop mixtures. Mixtures are listed hierarchically to the left of the table according to the relative dominance of each crop in the mixture. The three main crops are listed by name and any further crops are referred to by code letters. The column of "mean plot area" records the mean area of plots measured in the field according to the number of observations shown in the next column to the right. The column on the far right is the proportional area by crop mixture.

9.11 Crop mixtures are complex with 65 distinct mixtures recorded. Small areas of vegetables and tree crops are typically scattered among food gardens.

9.12 Table 9.4 summarises tree cropping. The table is in two parts, first showing the average number of trees and second the number of observations on which they are based. Each table is subdivided horizontally into cultivated garden and fallow, and vertically by garden type.

9.13 The averages in the top table are based on all plots (not only the plots in which trees are grown). In the far right column of the lower table is listed the number of observations for which trees are too numerous to count. These are excluded from the averages in the upper table.

CROPPING PATTERNS

all farmers

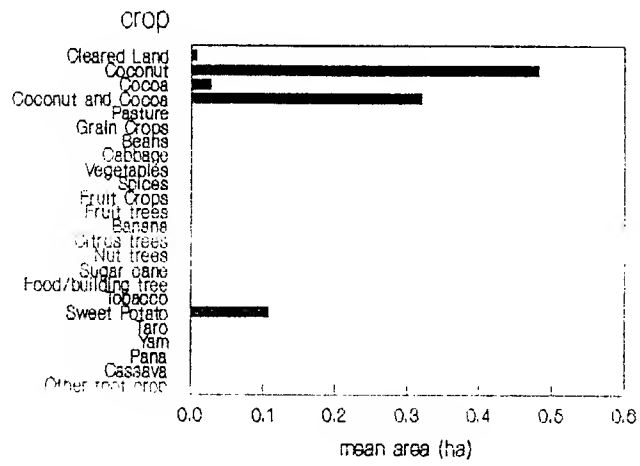


Diagram: 9.1

CROPPING PATTERNS

farmers with no tree crops

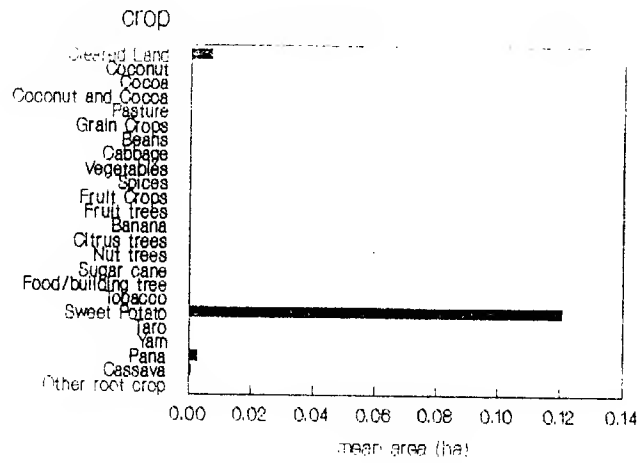


Diagram: 9.2

CROPPING PATTERNS

farmers with tree crops

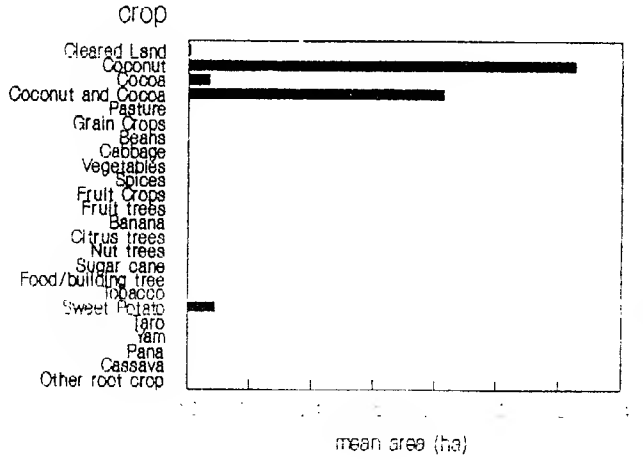


Diagram: 9.3

Table: 9.3
DETAILED CROPPING PATTERNS

crop code	main crop in mixture — crop name: first	second	third	minor mixture code	mean plot area (ha)	number of plots	% plots	% area
TOTAL					0.0547	156	100	100
a	Cleared land				0.0249	11	7	0.739
b	Coconuts				1.5643	12	8	50.76
		Cocoa			4.1514	3	2	33.67
c	Cocoa				0.5284	2	1	2.857
e	Grain Crops				0.0150	1	1	0.040
g	Cabbage				0.0085	4	3	0.091
		Banana			0.0042	1	1	0.011
h	Vegetables				0.0066	3	2	0.053
r	Sweet Potato				0.0381	38	24	3.916
		Cocoa			0.0246	1	1	0.066
		Grain Crops	Cabbage	l	0.0245	1	1	0.066
		Beans	Banana		0.0202	1	1	0.054
			Sugar Cane	j	0.0128	1	1	0.034
		Cabbage			0.0250	7	4	0.472
			Grain Crops		0.0166	2	1	0.089
			Beans		0.0235	2	1	0.127
				n	0.0221	1	1	0.059
				uo	0.0524	1	1	0.141
			Fruir Crops		0.0135	1	1	0.036
				l	0.0286	1	1	0.077
				no	0.1043	1	1	0.282
			Banana		0.0816	3	2	0.661
				e	0.0486	1	1	0.131
				n	0.0157	2	1	0.084
			Taro	l	0.0190	1	1	0.051
			Pana		0.0299	1	1	0.080
		Vegetable	Beans		0.0455	1	1	0.123
			Cabbage		0.0107	1	1	0.028
		Fruit Crops			0.0119	4	3	0.128
			Cabbage		0.0759	1	1	0.205
				l	0.0155	1	1	0.041
			Banana		0.1026	1	1	0.277
			Cassava	l	0.0324	1	1	0.087
		Banana			0.0234	3	2	0.189
			Coconut		0.0737	1	1	0.199
			Grain Crops	g	0.0917	1	1	0.247
			Cabbage		0.0479	1	1	0.129
			Fruit Crops		0.0193	1	1	0.052
			Sugar Cane		0.0098	1	1	0.026
			Taro		0.1349	2	1	0.729
		Sugar Cane			0.0087	1	1	0.023

CROPPING PATTERNS (continued)

crop code	main crop in mixture — crop name: first	second	third	minor mixture code	mean plot area (ha)	number of plots	% plots	% area
r		Taro			0.0279	1	1	0.075
			Beans		0.0205	1	1	0.055
			Cabbage		0.0266	1	1	0.071
			Banana		0.0258	1	1	0.069
			Pana		0.0373	1	1	0.100
		Yam	Cabbage		0.0480	1	1	0.129
		Pana	Cabbage	o	0.0525	1	1	0.141
			Banana		0.0623	1	1	0.168
			Yam	l	0.0900	1	1	0.243
		Cassava			0.0323	3	2	0.262
			Beans	l	0.0506	1	1	0.136
			Cabbage	j	0.0620	1	1	0.167
				l	0.0610	1	1	0.164
			Vegetable		0.1050	1	1	0.283
			Fruit Crops		0.0127	1	1	0.034
			Banana		0.0111	2	1	0.060
				gjn	0.0731	1	1	0.197
			Taro	l	0.0362	1	1	0.097
s	Taro				0.0060	1	1	0.016
t	Yam	Pana	Grain Crops		0.0153	1	1	0.041
u	Pana				0.0138	3	2	0.111
		Cabbage	Vegetables		0.0094	1	1	0.025
		Yam			0.0143	1	1	0.038
		Cassava	Cabbage	l	0.0177	1	1	0.047
v	Cassava				0.0119	3	2	0.096

Crop Key:

a Cleared land	j Fruit crops	r Sweet potato
b Coconut	k Fruit trees	s Taro
c Cocoa	l Banana	t Yam
d Pasture	m Citrus trees	u Pana
e Grain crops	n Nut trees	v Cassava
f Beans	o Sugar cane	w Other root crop
g Cabbage	p Food/building tree	
h Vegetable	q Tobacco	
i Spices		

Table: 9.4
TREE CROPS IN GARDENS

(---------- average number of trees per garden ----------)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) In cultivated gardens:					
fruit trees		0.12		0.57	0.44
citrus		0.59		0.38	0.44
nut trees		0.08		0.96	0.77
sweet banana				2.06	1.40
cooking banana				5.69	3.87
ii) In fallow of gardens:					
fruit trees				0.18	0.13
citrus				0.09	0.06
nut trees				0.30	0.22
sweet banana				0.49	0.35
cooking banana				0.42	0.31

(---------- number of observations ----------)

crop type:	cleared land	tree crops	short term cash crops	food crops	many but "unknown"
i) In cultivated gardens:					
fruit trees		17		46	1
citrus		17		47	
nut trees		12		45	7
sweet banana		17		36	11
cooking banana		17		36	11
ii) In fallow of gardens:					
fruit trees		17		45	2
citrus		17		46	1
nut trees		17		43	4
sweet banana		17		45	2
cooking banana		17		45	2

9.14 Bananas, particularly for cooking, nut trees and to a lesser extent fruit trees are crops of importance.

Chapter: 10
COCONUT AND COCOA

10.1 Coconut and cocoa have been studied in some detail before, both in the 1974-75 Sample Survey of Agriculture[5] and in the 1985 Coconut Survey[6]. Only comparative data are therefore included in the present survey.

10.2 Copra exports from Solomon Islands started in the late 19th century, rising from **1,220 MT** in 1895 to **23,000 MT** in the '20s and '30s. Following disruption during the second world war production did not achieve pre-war levels again until the 1960s. Copra production has continued to rise since, exceeding **40,000 MT** in 1984 and 1985. Following cyclone Namu copra production fell by about 20 to 25%, but showed some recovery in 1987/88.

10.3 The structure of the copra economy has varied considerably since the start of trading. Initially a smallholder crop, the plantation sector came to dominate production from 1915 onwards. Since the 1970s smallholder production has been growing by about **4.5%** annually and smallholder copra production now accounts for around **70%** of the total[8].

10.4 The area under smallholder coconuts has expanded considerably over the past 15 years, in part due to a subsidy scheme operating from 1968 to 1978 which was designed to encourage the rehabilitation, planting and replanting of coconut palms. Consequently the age structure of smallholder palms is young, with almost half the palms planted since 1970 and nearly **90%** planted since the war[8].

10.5 The total number of coconut palms in Solomon Islands is estimated to be around **9 million**, covering an area of approximately **60,000 hectares**. Table 10.1 shows the provincial breakdown of copra production, in which Western, Guadalcanal, Malaita and Central Provinces account for about **80%** of production.

10.6 The mean national copra yield is 0.72 MT per hectare according to the 1985 Coconut Survey[7]. The 1974-75 Sample Survey of Agriculture found that the average number of coconuts per palm was 36 (30 in the 1985 Coconut Survey) and assumes an average whole nut weight of **1.2kgs** with **190gm** dried copra equivalent per nut. Disciplined plantings were found to yield **40%** more per tree than customary plantings, but only **7%** more per unit area because of the greater density of customary planted trees. This result was was questioned in the 1985 Survey.

Table: 10.1
COPRA AREA AND PRODUCTION BY PROVINCE (1984)

Province	area (ha)	area %	production (MT)	production %	yield (MT/ha)	number of palms
Western	14,454	25	13,816	32	0.96	2,093,795
Ysabel	5,230	9	2,969	7	0.57	817,555
Central	7,909	13	9,073	21	1.15	1,287,680
Guadalcanal	12,758	22	7,324	17	0.57	1,824,790
Malaita	11,890	20	5,575	13	0.47	1,980,595
Makira	3,555	6	2,662	6	0.75	540,810
Temotu	3,032	5	1,167	3	0.38	494,420
Total	58,918	100	42,586	100	0.72	9,039,645

Source: Statistics Office, Solomon Islands (1986), Statistical Bulletin 18/86

10.7 The yield from well maintained plantations was found to be higher than from poorly maintained plantations, but the 1985 Coconut Survey attributed this to more intensive harvesting rather than the productivity of palms[5].

10.8 In the 1985 Coconut Survey soil type was classified into three broad categories. **41%** of plots lay on sand or coral; **47%** on black alluvial soils; and **21%** on red clay. It was concluded that the reason for low yields is often area specific but soil nutrient deficiency, notably potassium, is an important factor. Despite this, and high copra prices at the time, the 1974-75 survey found that "fertilizer is only applied when provided under some sort of subsidy scheme" and that "smallholder farmers will not buy fertilizer to use on their own plots. There is generally a lack of understanding of the use of fertilizer by farmers, and in many cases a reluctance to use it even when it is provided at a subsidised price"[5].

10.9 Other important factors identified in the 1985 Coconut Survey as affecting production were pests and disease. Over half the plots sampled in the 1985 suffered from Leaf Spot, which may refer to the symptoms of pest infestation or nutrient deficiency. One quarter of plots showed some evidence of White Thread, but it was felt that neither problem significantly affected output. About 40 ot 50 percent of plots were felt to be disease free (7).

10.10 Amblypelta cocophaga appeared to be a significant pest in parts of Western province, the Floridas, Guadalcanal and Malaita. 38% of households reported premature nutfall which is linked to Amblypelta in certain localities. Brontispa spp was also evident, and minor pests included rhinoceros beetle (Scapanes australis), rats, cockatoos, flying foxes and others (7).

10.11 The coconut survey of 1985 found that the average spacing of 7.5metres for palms was not significantly different between triangular and square planted plots. On customary plantings there was a wide variation in planting density, but the majority of plots were similar to disciplined plantings (7).

10.12 The 1974-75 sample survey of agriculture found that more than half of all immature palms were well maintained. Among bearing trees more than 60% of disciplined plantings were well maintained compared to 47% of customary planted palms (5). The 1985 coconut survey found lower management standards, and that even with 30% of farmers hiring workers to assist with maintenance only 39% of plots were well brushed. 47% revealed weed growth to shoulder height, and 13% of plots were totally neglected (7). The relationship between levels of maintenance, yield and soil conditions was not established in the 1985 survey.

10.13 Table 10.2 presents additional results from the present study. 11 plots of coconuts in pure stand are recorded, with 2 plots of cocoa and 4 plots of coconut and cocoa.

10.14 Maintenance standards in the survey area are high, with plots brushed at least to shoulder height, and most plots brushed to ground level. Maintenance levels are illustrated in diagram 10.1.

Table: 10.2
COCONUTS AND COCOA

	% plots		
	coconut	cocoa	coconut + cocoa
i) Intercropping:			
Pure stand	91	100	
Intercropping with:			
Coconut + cocoa			100
Short term cash crops			
Food crops			
Livestock	9		
Total %	100	100	100
Number of observations (plots)	11	2	4
ii) Maintenance:			
Undercropped			25
Brushed to ground level	64	100	75
Brushed to shoulder height	36		
Secondary bush			
Burnt			
Total %	100	100	100
Number of plots	11	2	4
iii) Coconut variety composition			
Tall	100		100
Rennel			
Dwarf			
Other			
Total %	100		100
Number of plots	11		4
iv) Coconut age composition			
< 8 years	15		
9 - 16 years	34		25
17 - 40 years	45		75
> 40 years	5		
senescent			
Total %	100		100
Number of plots	11		4

v) Cocoa age composition

< 3 years	50	
3 - 5 years		50
6 - 25 years	50	50
> 25 years		
Total %	100	100
Number of plots	2	4

vi) Cocoa shade

coconuts		100
planted shade		
natural shade	100	
planted and natural		
Total %	100	100
Number of plots	2	4

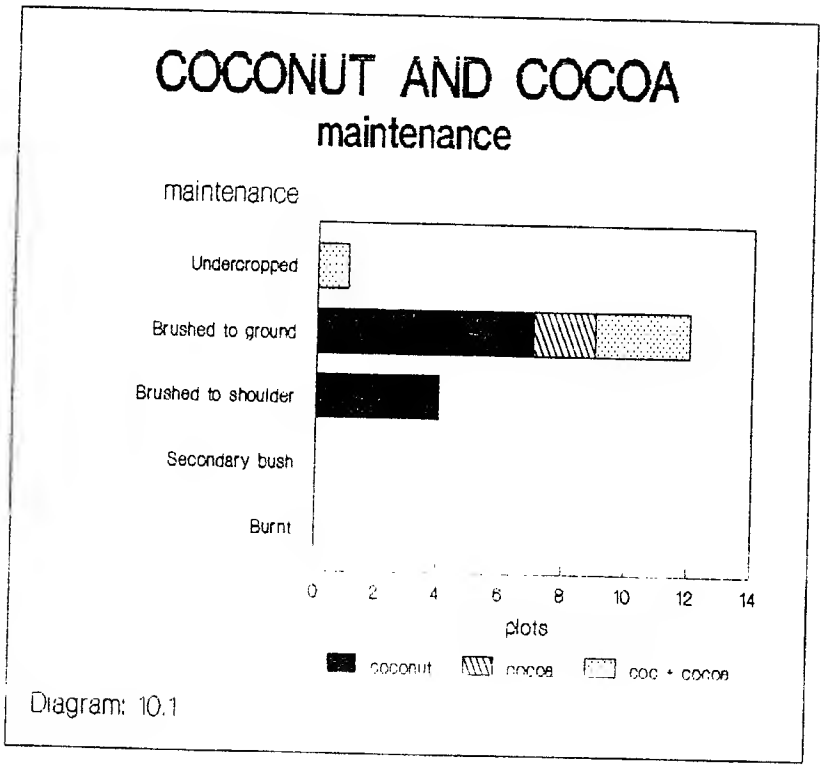


Diagram: 10.1

10.15 In the survey the coconut variety is local tall and stands are mostly in the age group 9 - 40 years, with some young plantings.

10.16 50% of cocoa plantings (3 plots) are aged 6 - 25 years and 50% are less than 5 years. In fact all plots are young and little cocoa production takes place among sampled households at this stage.

Chapter: 11
FALLOW

11.1 Throughout Solomon Islands almost all gardens are cultivated according to a form of shifting cultivation with bush fallow. In the 1974-75 Sample Survey of Agriculture it was found that, where population density or land tenure problems have restricted the availability of suitable land, the length of fallow may be reduced from the optimum 7 to 20 years to as little as one or two years. In such areas soil fertility is diminished through over frequent cropping[5].

11.2 Solomon Islands soils generally have a low to very low potassium status. The geology of the country is composed in the main of rocks which are low in potassium bearing minerals, and potassium is readily leached under conditions of continuously high rainfall and rugged topography. Fallow is essential for the restoration of potassium fertility: "Under traditional shifting cultivation the depletion of potassium by crops is gradually reversed over a period of 3-15 years or more by a combination of mineral weathering and root systems incorporating potash in the nutrient cycle". Although burning leads to an erratic distribution of potassium in the topsoil, "the burning of vegetative trash is beneficial and it has been shown that topsoil potassium is increased by as much as 100% on average after burning, all of this increase being held by the exchange complex"[9].

11.3 Research on Malaita has shown that the average tuber yield of sweet potato is **9.3t/ha** on sites of more than 10 years of fallow, falling off rapidly to **6.0t/ha** on land of 5 - 9 years of fallow; **4.8t/ha** on land of 0 - 4 years of fallow; and **3.5t/ha** on successively cropped land. A residual yield of 2 - 6t/ha "seems to represent the rate of release of potassium from slowly available reserves in soil and weathering parent material within rooting depth". Large amounts of fertiliser are required to restore yields. A supply of 112kg/ha K is only marginally beneficial and inadequate to replenish the rate of potassium removal by the crop. 200 to 300kg/ha K is said to be required to restore yields to levels commensurate with long fallow periods[9].

11.4 Phosphorus varies widely in its total and available forms, but Solomon Islands soils generally have low levels in the subsoil and medium levels of total phosphorus in the topsoil. Most soils used for agriculture have satisfactory levels of phosphorus but as land pressure increases deficiencies may become more widespread. Humus in the topsoil is accompanied by an increase in phosphorus, mainly in organic form, which may become readily available[9].

11.5 Soil total nitrogen levels are generally adequate, with C:N ratios in the range 7-13 signifying the ready availability of nitrogen. Topsoil nitrogen is dependent on land use and in particular the length of fallow since there is a build-up of topsoil nitrogen under secondary regrowth. Sulphur is similarly associated with organic matter, and is higher under forest than under burned grassland[9].

11.6 There is a close relationship between pH and organic matter. The lower the pH the greater the surface organic matter and the higher the subsoil organic carbon content. Difficulties associated with low pH such as aluminium toxicity are only likely to be widespread in the New Georgia group and possibly Ysabel. Alkaline soils are fairly widespread and are associated with reef limestone. The chief problem induced by alkaline calcareous soils is lime induced chlorosis of foliage which results from deficiencies of iron, manganese, zinc and copper[9].

11.7 In addition there is a close relationship between soil depth and soil fertility. "All stable sites tend to favour an accumulation of maximum weathered material due to minimal losses by surface erosion. Thus there arises the paradox that on stable hill sites and terraces the soils tend to be deepest but least fertile, while on adjacent steep slopes the soils are relatively unweathered, and hence fertile, but shallow"[9].

11.8 The shifting system of smallholder agriculture in Solomon Islands is suited to the environment and prevailing management where land pressure is low. Soil fertility is restored during fallow periods, and small isolated areas of mixed cropping are not conducive to pest build-up. Burning of surface vegetative trash not only releases a flush of nutrients, of which the most important is potassium, but is also a useful phytosanitary measure which destroys weed seeds, some insects and undesirable pathogens[9].

11.9 An analysis of fallow therefore tells much about the dynamics of smallholder agriculture, and likely pressures on farming systems. Hansell and Wall[10] state that "there is little doubt that the major factor influencing the decision to abandon the garden is the decline in crop productivity but the exact causes of the decline are not fully understood". The greatest decline in production is between the first and second crops, rather than between the second and subsequent crops. They estimate that despite reduced yields there is still a good return from a low input of labour and conclude that reduced yields alone is insufficient reason for the abandonment of a garden. An important consideration may be the build-up of soil-borne plant diseases causing the rotting of corms or tubers, insect attack and weed infestation[10].

11.10 In the 1974-75 Sample Survey of Agriculture[5] it was stated that, while in overall terms Solomon Islands cannot be said to be suffering from land pressure, it may occur in some areas. Table 11.1 shows the distribution of garden land by the length of the bush fallow in 1975.

Table: 11.1
LENGTH OF BUSH FALLOW (1975)

length of bush fallow (years)	Western	Ysabel Central Guadalcanal	Malaita	Makira Temotu	Solomon Islands
		% observations			
< 2	23	6	17	16	14
2 - 4	20	5	33	14	18
5 - 7	4	11	25	12	15
8 - 10	10	10	8	15	10
> 10	13	20	3	14	13
never previously cultivated	29	48	15	29	32
Mean length fallow (years)	5.6	9.2	4.5	6.7	6.4

Source: Statistics Office (1978), 1974-75 Agricultural Statistics Survey

11.11 Table 11.2, also from the 1974-75 survey, shows the distribution of garden land by length of cultivation.

Table: 11.2
LENGTH OF CULTIVATION (1975)

length of cultivation (months)	Western	Ysabel Central Guadalcanal	Malaita	Makira Temotu	Solomon Islands
	% observations				
< 4	20	45	11	19	27
4 - 6	62	31	36	22	37
7 - 9	12	13	25	33	19
10 - 12	5	8	14	18	10
> 12	2	4	14	8	7
Mean cultivation (months)	5.1	4.7	7.6	7.2	6.0

Source: Statistics Office (1978), 1974-75 Agricultural Statistics Survey

11.12 In 1975 it was found that 32% of gardens in Solomon islands had never been previously cultivated, and that the average length of bush fallow of cultivated gardens was 6.4 years. Only 7% of gardens were generally cultivated for more than 12 months before reverting to fallow, and the average length of cultivation of food gardens was 6 months.

11.13 Table 11.3 summarises cropping intensity in the survey area. The crop period is shown in the first column, which is the time from planting to harvest for the named crop.

Table: 11.3
CROPPING INTENSITY

crop type		harvest to harvest (months)	number of crops in sequence	number of cases (obs)
all crops		4.4	4.8	147
cleared land	a	5.0	3.4	2
coconut	b	3.3	1.1	12
cocoa	c		1.5	2
coconut + cocoa	z	1.7	1.3	3
grain crops	e	4.0	3.0	1
cabbage	g	3.0	2.0	5
vegetables	h	3.0	4.0	3
sweet potato	r	4.2	5.6	108
taro	s	5.0	7.0	1
yam	t	4.0	3.0	1
pana	u	7.2	5.7	6
cassava	v	6.0	4.3	3

11.14 The second column describes the number of times an area is cropped in sequence before reverting to fallow. This introduces complexity since the crop type may, and commonly does, change within the sequence. The table therefore shows different stages in the cropping sequence. The dominant root crop is sweet potato with 108 observations, while taro, yam, pana and cassava have 11 observations.

11.15 Table 11.4 describes the fallow period, however, this has little meaning for tree crops since the interpretation of fallow varies with the age of the tree crop and previous cropping history. For food crops the fallow period relies on the knowledge of the respondent. Often it is found that long fallow periods are beyond the memory of operators and these are referred to as "cases longer than memory". 62% of gardens have such long fallows. Where the fallow period is known on food gardens there are 4.7 years of fallow between cropping.

Table: 11.4
FALLOW PERIOD (years)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
mean years of fallow		5.0		4.7	4.7
standard deviation (years)		7.1		2.7	3.0
number of cases (gardens)		2		22	24
cases longer than memory					40
total cases (gardens)					64

11.16 Fallow periods cover a range of soil and site conditions, and are themselves variable. Table 11.5 shows that 53% of fallow periods on food gardens are longer than memory, extending over 73% of the food garden area.

Table: 11.5
FALLOW RANGE

i) Fallow Range by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no fallow		1			1
1 year				2	2
2 years				2	2
3 years				3	3
4 years				6	6
5 years				4	4
6 - 10 years		1		5	6
11 - 20 years					
21 - 50 years					
beyond memory ("long time")		15		25	40
total by crop type		17		47	64

ii) Fallow Range by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no fallow		3			3
1 year					
2 years					
3 years					
4 years				3	3
5 years					
6 - 10 years		3			3
11 - 20 years					
21 - 50 years					
beyond memory ("long time")		84		8	92
total by crop type		89		11	100

Note: The table of % area is only approximate due to rounding small numbers

11.17 The type of fallow in the survey area is shown in table 11.6.

Table: 11.6
FALLOW TYPE

i) Fallow type by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
primary forest		7		4	11
secondary forest		9		31	40
dense thicket				9	9
open scrub grassland				3	3
grassland		1			1
plantation trees/planted					
continuous cropping					
total by crop type		17		47	64

ii) Fallow type by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
primary forest		47			47
secondary forest		36		8	44
dense thicket				3	3
open scrub grassland					
grassland		6			6
plantation trees/planted					
continuous cropping					
total by crop type		89		11	100

Note: The table of % area is only approximate due to rounding small numbers

11.18 **80%** of all gardens have a fallow of primary or secondary forest extending over **91%** of the farmed area.

11.19 **9%** of the food gardens are cut from primary forest, representing an insignificant area. **41%** of tree gardens are cut from primary forest on **53%** of the tree crop area.

11.20 Table 11.7 summarises the application of agricultural inputs for the control of pests and maintenance of soil fertility. Unique to this survey is the application of "compost" fertiliser from cave dwelling birds, recorded on 12 food gardens. Other inputs include volcanic pumice, but also include the mis-recording of bird manure.

Table: 11.7
MANAGEMENT AND APPLICATION OF AGRICULTURAL INPUTS
i) Inputs by frequency of use (gardens)

crop type		row planting	fert-iliser	pest-icide	compost	ash	other	frequency of plots
all crops		15			12		4	156
cleared land	a							11
coconut	b	9						12
cocoa	c	2						2
coconut + cocoa	z	3					1	3
grain crops	e							1
cabbage	g						1	5
vegetables	h	1						3
sweet potato	r				9		2	108
taro	s				1			1
yam	t							1
pana	u				1			6
cassava	v				1			3

ii) Inputs by % area applied

crop type	row planting	fert-iliser	pest-icide	compost	ash	other
all crops	76			3		22
cleared land						
coconut	41					
cocoa	3					
coconut + cocoa	32					
grain crops						
cabbage						
vegetables						
sweet potato				3		22
taro						
yam						
pana						
cassava						

Note: The table of % area is only approximate due to rounding small numbers

Chapter: 12
LANDFORM

12.1 Kolombangara is characterised by a broad, low-lying plains over extensive areas, with steeply rising hills in the interior. There is generally an abundance of flat land which is demarcated for agriculture, while the hills are forested. Farming systems in the survey area are therefore uncommonly flat.

12.2 Landforms are broadly subdivided into "lowland" and "upland" where "upland" simply means above the coastal plain or coastal terrace, but does not imply high elevation. Table 12.1 shows the distribution of cultivated land in the survey by landform. The first part of the table records the number of observations (gardens) which is expressed in area terms in the second part of the table.

12.3 All tree gardens, and almost all food gardens are on lowlands sites, mainly beach and lowland plain for tree gardens and plains, river channels and terraces for food gardens.

12.4 A summary of landform and cropping is illustrated in diagram 12.1.

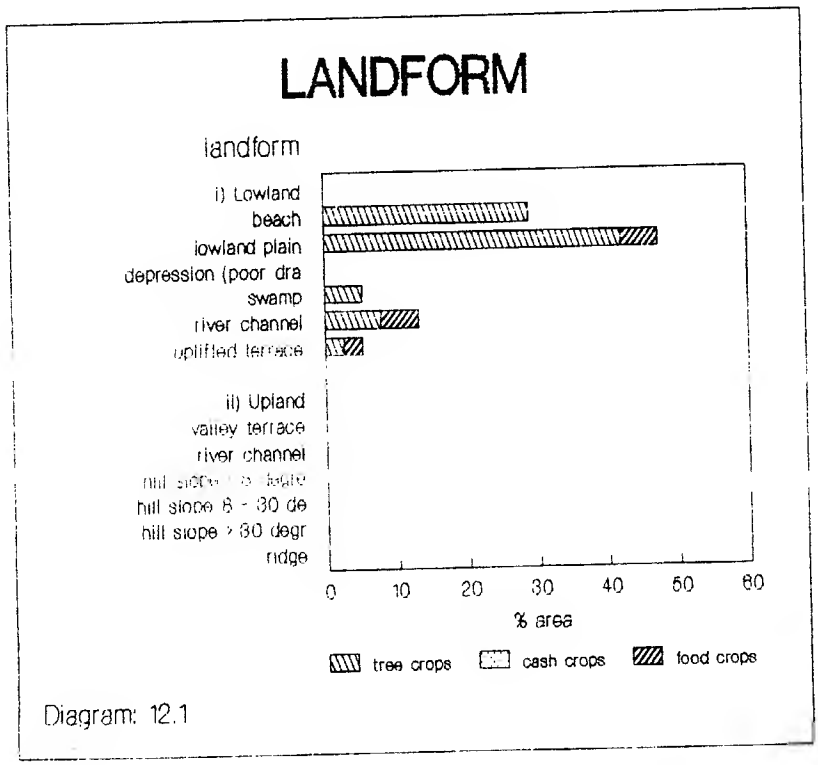


Diagram: 12.1

Table: 12.1
LANDFORM

i) Landform by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Lowland					
beach		4		1	5
lowland plain		10		27	37
depression (poor drainage)					
swamp		1			1
river channel		1		13	14
uplifted terrace		1		4	5
ii) Upland					
valley terrace					
river channel				1	1
hill slope < 8 degrees				1	1
hill slope 8 - 30 degrees					
hill slope > 30 degrees					
ridge					
total by crop type		17		47	64

ii) Landform by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Lowland					
beach		29			29
lowland plain		42		5	47
depression (poor drainage)					
swamp		5			5
river channel		8		5	13
uplifted terrace		3		3	5
ii) Upland					
valley terrace					
river channel					
hill slope < 8 degrees					
hill slope 8 - 30 degrees					
hill slope > 30 degrees					
ridge					
total by crop type		87		13	100

Note: The table of % area is only approximate due to rounding small numbers

12.5 Table 12.2 describes the characteristics of slope in farming systems. The first part of the table records the frequency of observations (plots) which is expressed in area terms in the second part of the table. The mean slope is only 1 degree, and few plots are recorded with slopes of greater than five degrees and to a maximum of 10 degrees.

Table: 12.2

SLOPE

i) Slope by number of observations (gardens)

crop type		mean slope (degrees)	frequency of plots at different degrees of slope						frequency of plots
			0 - 5 degrees	5 - 10 degrees	10 - 20 degrees	20 - 30 degrees	30 - 50 degrees	> 50 degrees	
all crops		1	153	3					156
cleared land	a		11						11
coconut	b	1	11	1					12
cocoa	c	4	1	1					2
coconut + cocoa	z		3						3
grain crops	e		1						1
cabbage	g	1	5						5
vegetables	h		3						3
sweet potato	r	0	107	1					108
taro	s		1						1
yam	t	2	1						1
pana	u	1	6						6
cassava	v	1	3						3

ii) Slope by % cropped area

crop type	frequency of plots at different degrees of slope						total
	0 - 5 degrees	5 - 10 degrees	10 - 20 degrees	20 - 30 degrees	30 - 50 degrees	> 50 degrees	
all crops	92	8					100
cleared land							
coconut	46	5					51
cocoa	3	3					5
coconut + cocoa	32						32
grain crops							
cabbage							
vegetables							
sweet potato	11						11
taro							
yam							
pana							
cassava							

Note: The table of % area is only approximate due to rounding small numbers

12.6 Table 12.3 summarises conservation measures. No conservation practices or alley cropping were encountered in the survey.

Table: 12.3
CONSERVATION AND ALLEY CROPPING

i) Conservation by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Conservation none contour cultivation bunding terracing		17		47	64
ii) Alley cropping not performed performed		17		47	64
total by crop type		17		47	64

ii) Conservation by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Conservation none contour cultivation bunding terracing		86		14	100
ii) Alley cropping not performed performed		86		14	100
total by crop type		86		14	100

Note: The table of % area is only approximate due to rounding small numbers

12.8 The spatial distribution of gardens is shown in diagrams 12.2 to 12.4, which illustrate the relationships between crop type, crop area, and the distance of gardens from households.

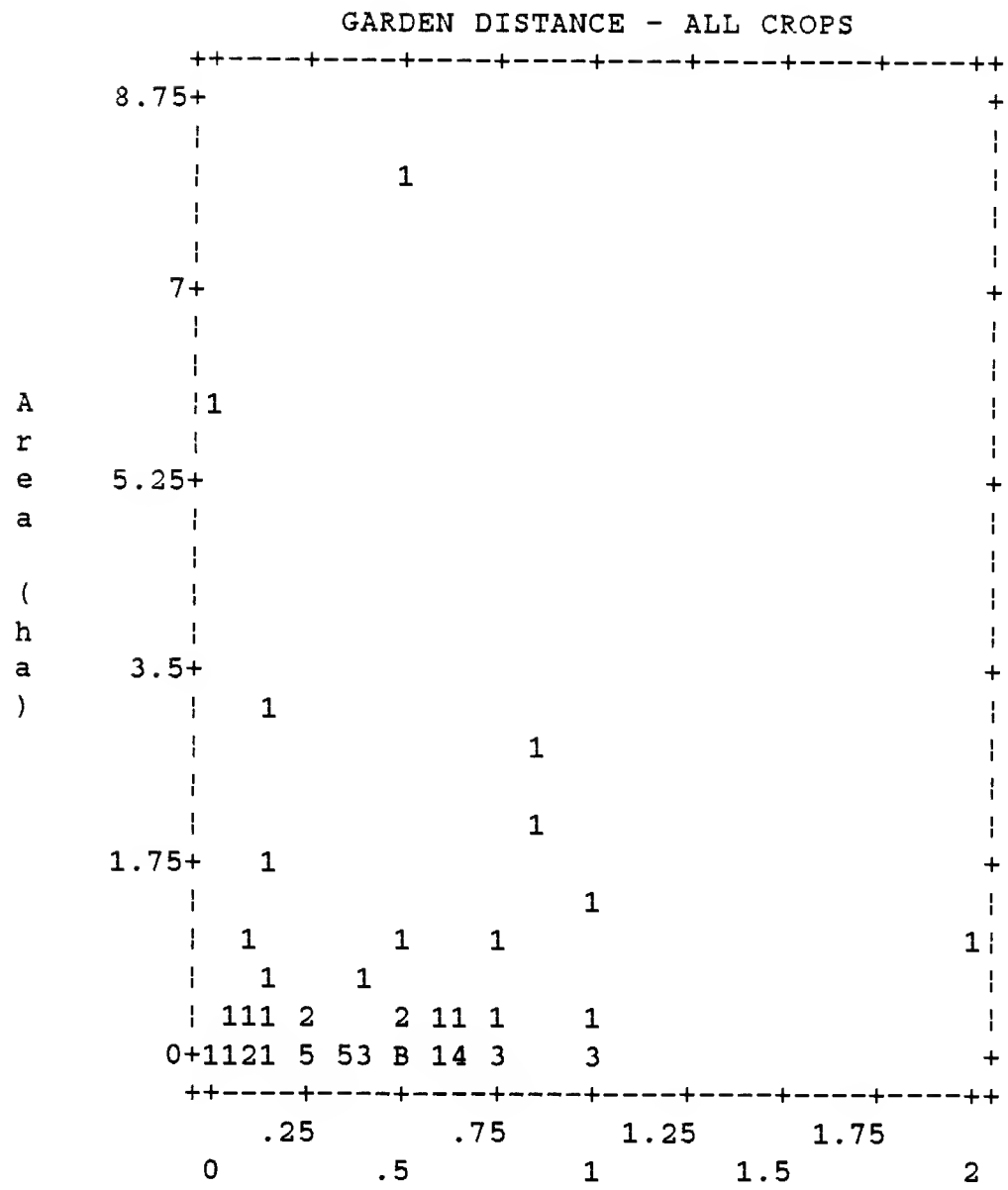
2.9 Diagram 12.2 is the graph of gardens for all crops, while subsequent diagrams show the distance relationships for the major crop types. The graph shows the relationship between garden area (vertical axis) and the time taken to reach the garden from the household (horizontal axis). Graph entries represent the number of observations (gardens) and are numbered from 1 to 9 and thereafter alphabetically. Thus where points coincide the number of points is shown: 9 occurrences is recorded as "9"; 10 occurrences as "A"; 13 occurrences as "D"; and so on.

12.10 The mean time taken to reach gardens is **.332 hours** or about 20 minutes, with a maximum time of **2.00 hours.**

12.11 Diagram 12.3 shows the relationship between distance and area of tree crop gardens. The mean time taken to reach tree crop gardens from the household is **.421 hours**, with a maximum recorded time of **2.00 hours.**

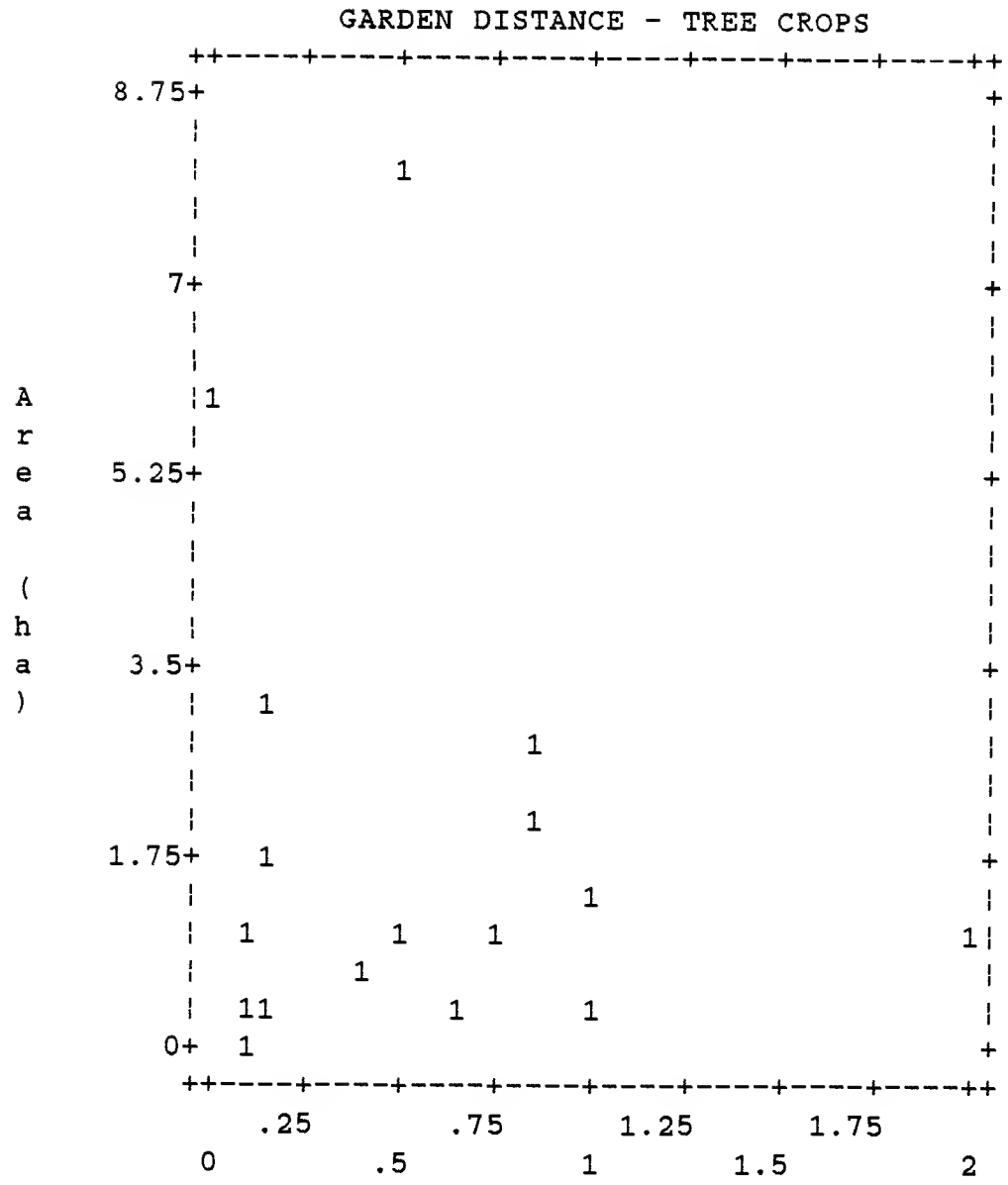
12.13 The mean time taken to reach food gardens from the household is **.300** hours, with a maximum time of **1.00** hours.

Diagram: 12.2



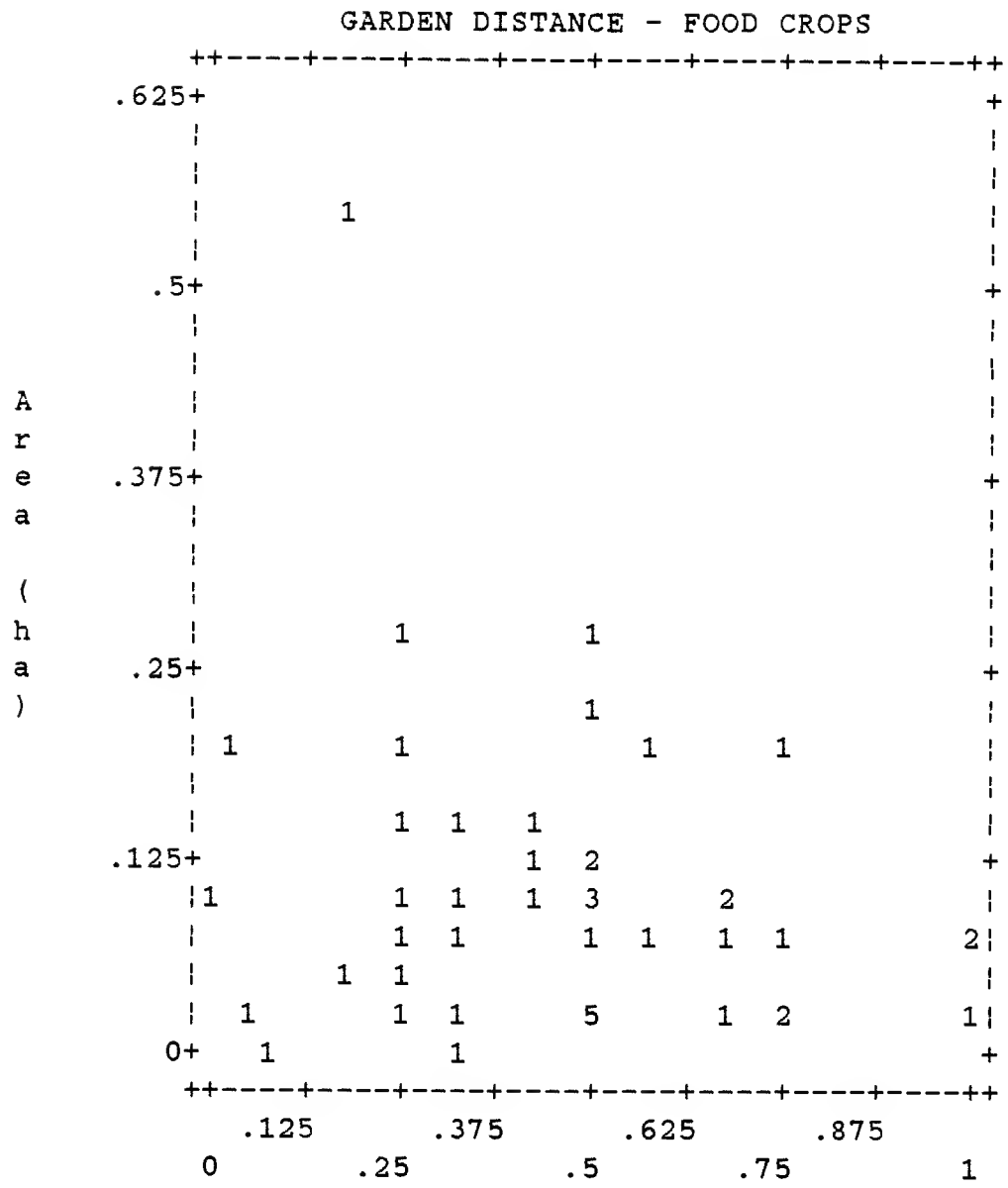
Mean = .332 hrs
Max = 2.00 hrs
Number of observations (gardens) = 64

Diagram: 12.3



Mean = .421 hrs
Max = 2.00 hrs
Number of observations (gardens) = 17

Diagram: 12.4



Mean = .300 hrs
Max = 1.00 hrs

Number of observations (gardens) = 47

Chapter: 13
ADVERSE FACTORS AFFECTING PRODUCTION

13.1 Table 13.1 describes site factors which farmers regard as problems. The first part of the table specifies the number of observations (gardens), which is expressed as the proportion of cultivated area affected in the second part of the table.

Table: 13.1
SITE CONDITIONS

i) Site Conditions by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no site limitation		13		24	37
poor soil/site		1		7	8
pest/disease problem		2		7	9
poor site + pests					
weed problem		1		4	5
weeds + poor site					
weeds + pests				4	4
weeds + site + pests				1	1
total by crop type		17		47	64

ii) Site Conditions by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no site limitation		65		8	73
poor soil/site		16			16
pest/disease problem		5		3	8
poor site + pests					
weed problem					
weeds + poor site					
weeds + pests				3	3
weeds + site + pests					
total by crop type		86		14	100

Note: The table of % area is only approximate due to rounding small numbers

13.2 **58%** of all gardens (37 gardens) representing **73%** of the cultivated area have no apparent site limitations. Site problems may be summarised by grouping the main factors as follows:

	% gardens	% area
No site limitations	58	73
Poor soil/site	**14**	**16**
Pests/disease	**22**	**11**
Weeds	**16**	**3**

Site conditions are illustrated in diagram 13.1.

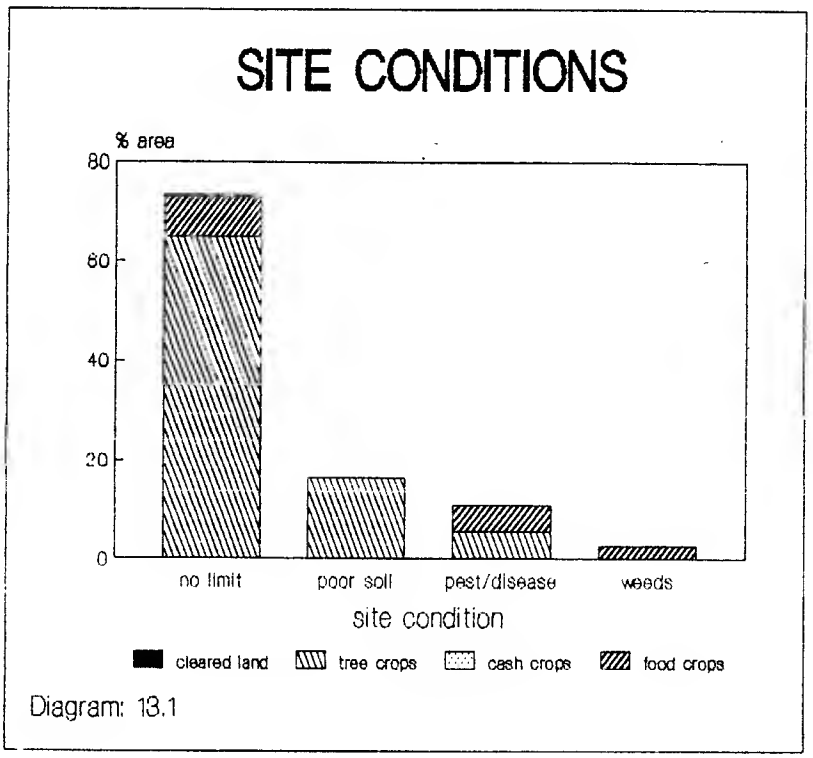


Diagram: 13.1

13.3 Problems encountered are minor, and are unusual compared with farming systems elsewhere since weeds on tree crops is not a problem. Maintenance standards are high and holdings are relatively small. The main problems, although fairly minor in extent, are poor soil and pests and disease.

13.4 Table 13.2 describes major crop damage recorded. Damage included livestock damage to cocoa under coconuts; crabs on sweet potato; rhinocerous beetle on banana; and taro beetle on taro.

Table: 13.2
CROP DAMAGE

i) Crop Damage by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no damage		14		38	52
cyclone damage					
other damage		3		9	12
cyclone and other damage					
total by crop type		17		47	64

ii) Crop Damage by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no damage		78		11	89
cyclone damage					
other damage		11			11
cyclone and other damage					
total by crop type		89		11	100

Note: The table of % area is only approximate due to rounding small numbers

13.6 Annex 3 provides a more detailed description of factors damaging crop mixtures, summarised at the plot level. It is not possible at this stage to present results at the crop level. Results are summarised in table 13.3 and are illustrated in diagram 13.2.

Table: 13.3
SUMMARY OF CROP DAMAGE

nature of damage		% cropped area affected
insects affecting	leaves	14
	fruits	39
	roots	
disease affecting	leaves	6
	fruits	39
	roots	
damage due to	humans	3
	fire	
	flood	
	wind	6
	rats	8
	birds	17
	bats	3
	livestock	22
	other	

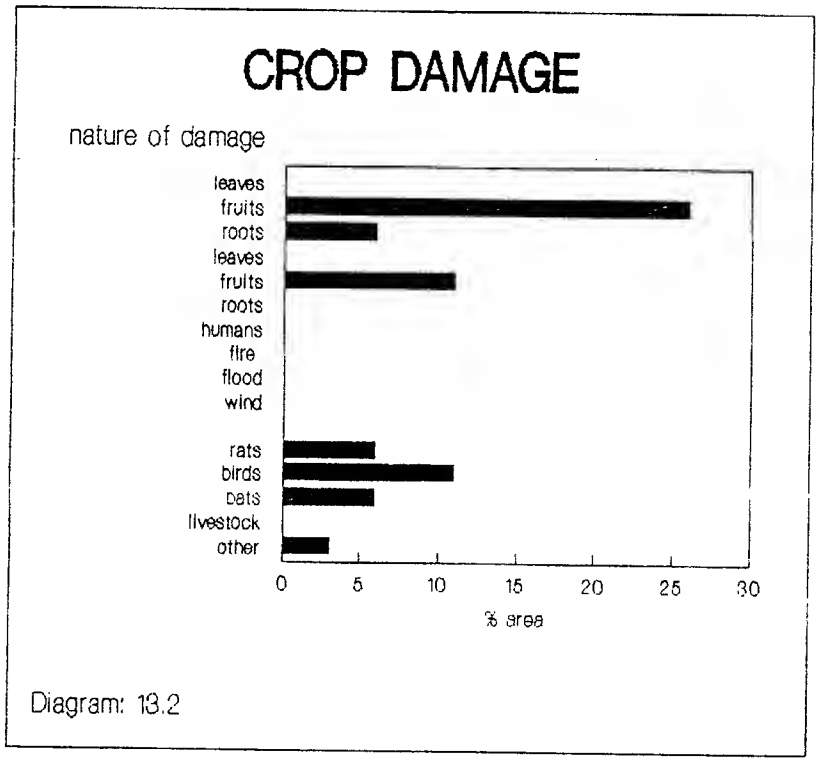


Diagram: 13.2

Chapter: 14
CROP YIELDS

14.1 Production data on smallholder agriculture are scarce, largely due to practical difficulties associated with measuring yields in complex cropping systems that lack clear temporal and spatial boundaries. Smallholder agriculture is a continuous process in which there is little seasonality, so that any or all stages of crop growth and management operations may be exhibited at any time, with crops commonly harvested selectively over time. Table 14.1 summarises the planting characteristics of smallholder crops in the survey area.

Table: 14.1
CROP VARIETY AND SPACING

⟨-------- crop type ----------⟩		number of observations	% improved	⟨---------- spacing (% obs) ----------⟩ customary	regular	recommended ⟨---- tree crops ----⟩ triangular	square
Cleared	Cleared land	5					
Coconut/Cocoa	Coconuts	14	7	21	50	14	14
	Cocoa	6	50		50	17	33
Ground crops	Grain crops	10	10	100			
	Beans	15		100			
	Cabbage	57	4	95	5		
	Vegetable	11	18	100			
	Chillie						
	Fruit Crops	25		92	4	4	
Tree/other crops	Fruit trees	2		100			
	Banana	47		96	4		
	Citrus trees	2		100			
	Nut trees	6		67	33		
	Sugar cane	3		100			
	Food/building tree						
	Tobacco						
Root crops	Sweet potato	106		100			
	Taro Common	7		100			
	Giant	1		100			
	Hong Kong	3		100			
	Swamp						
	Yam	4		100			
	Pana	17		100			
	Cassava	22		100			
	Other root crop						
Total		363					

14.2 The second column refers to the introduction of non-traditional planting material, either through extension or research, or from other sources.

14.3 For non-tree crops there are three types of spacing identified, being "customary", "regular" and "recommended". "Customary" means there is no discernable order in the plot. "Regular" means planting according to a visible pattern, such as in rows. "Recommended" refers to the adoption of recommended practices, which may not necessarily be "regular". For tree crops there are four categories of "customary", "regular", "triangular" and "square". "Customary" and "regular" follow the same rules as non-tree crops. "Triangular" and "square" equate with recommended practices for coconuts.

14.4 Crop mixtures in smallholder farming systems are complex, as seen in table 9.3. Table 14.2 describes something of the the complexity of planting densities wher crops other than coconuts are generally grown in complex mixtures.

Table: 14.2
CROP DOMINANCE IN MIXTURES

crop type		number of observations	% dominance in mixture									
			0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Cleared	Cleared land	5										
Coconut/Cocoa	Coconuts	14	21				21				7	50
	Cocoa	6	17			17	50					17
Ground crops	Grain crops	10	60	30								10
	Beans	15	93			7						
	Cabbage	57	72	19	2	2						5
	Vegetable	11	82			9						9
	Chillie											
	Fruit Crops	25	80	12	4	4						
Tree/other crops	Fruit trees	2	100									
	Banana	47	91	4	4							
	Citrus trees	2	100									
	Nut trees	6	100									
	Sugar cane	3	100									
	Food/building tree											
	Tobacco											
Root crops	Sweet potato	106				2	8	8	13	13	26	29
	Taro Common	7	43	43								14
	Giant	1	100									
	Hong Kong	3	67				33					
	Swamp											
	Yam	4	25				50			25		
	Pana	17	47	12	6	12	6				6	--
	Cassava	22	55	14	9	9	5					9
	Other root crop											
Total		363										

14.5 A visual assessment of yields is presented in table 14.3.

Table: 14.3
CROP PRODUCTION

‹--------- crop type ----------›		number of observations	‹------- yield appearance (% obs) -------› zero	low	moderate	high
Cleared	Cleared land	5				
Coconut/Cocoa	Coconuts	14	14	21	36	29
	Cocoa	6	17	33	33	17
Ground crops	Grain crops	10		50	30	20
	Beans	15		13	60	27
	Cabbage	57		14	72	14
	Vegetable	11			36	64
	Chillie					
	Fruit Crops	25		52	36	12
Tree/other crops	Fruit trees	2			50	50
	Banana	47	2	60	28	11
	Citrus trees	2			50	50
	Nut trees	6		33	17	50
	Sugar cane	3		33	67	
	Food/building tree					
	Tobacco					
Root crops	Sweet potato	106		7	37	57
	Taro Common	7			57	43
	Giant	1			100	
	Hong Kong	3			67	33
	Swamp					
	Yam	4			50	50
	Pana	17			59	41
	Cassava	22		9	68	23
	Other root crop					
Total		363				

14.6 Crop yields are variable but for the most part are moderate to high.

14.7 In an intensive case study of this kind it is difficult to obtain a reasonable coverage of crop yields, although these are recorded where possible in the course of the survey [12]. A crop production study has been designed to generate yield data [22] but it has not been possible to implement this yet. For the present report yields are largely derived from secondary sources.

a) **COCONUT:**

14.8 Coconut production data from the 1974-75 agricultural survey are summarised in table 14.4.

Table: 14.4
COCONUT PRODUCTION DATA FROM 1974-75 AGRICULTURAL SURVEY

	Province				Mean
	Western	Ysabel Central Guadalcanal	Malaita	Makira Temotu	Solomon Islands
number of yield sites	28	32	3	30	93
coconuts per palm: disciplined	53	54	19	34	44
customary	22	36	1	41	31
mean	31	42	14	37	36
coconuts per ha : disciplined	8,194	8,983	2,822	5,773	7,178
customary	4,658	8,595	135	7,432	6,703
mean	5,794	8,753	1,926	6,492	6,913
% damaged/unusable nuts: disciplined	12	10	12	20	14
customary	19	13	36	6	13
mean	16	12	12	13	14
gross copra yield (kg/ha): disciplined	1,541	1,689	531	1,086	1,450
customary	876	1,616	25	1,398	1,261
mean	1,081	1,646	362	1,221	1,300
net yield (kg/ha): disciplined	1,356	1,520	467	869	1,247
customary	709	1,406	16	1,314	1,097
mean	908	1,448	318	1,062	1,118

Source: Statistics Office (1978) "1974-75 Agricultural Statistics Survey".
Note: Copra yields assumse 190gm dried copra per nut quoted in the Statistics Office report

14.9 In the 1974-75 agricultural survey the mean coconut yield is estimated to be **1,300kg/ha** copra equivalent, or **1,118kg/ha** when unusable nuts are discounted. The average daily consumption of coconuts was found to be **4.2** per household, resulting in a national annual consumption equivalent of **8,871MT** copra. If green nuts are taken into account it was believed that the copra equivalent consumed would be **10,000MT**[5] in a year when exports amounted to **28,000MT.**

14.10 Charles (1980) estimates lower levels of copra production with estate yields of **827kg/ha** and smallholder yields of **410kg/ha** The difference he attributed to a high proportion of immature plantings and the consumption of coconuts in the smallholder sector[23]. Average copra production derived from the 1985 coconut survey is estimated in the (draft) Farm Management Handbook[24] for Solomon Islands to be **0.72MT/ha**, although provincial yields vary from **1.15MT/ha** in Central Province, which is dominated by the Levers plantation in the Russel Islands, to **0.38MT/ha** in Temotu.

14.11 In conjunction with the 1985 coconut survey the Research Department of the Ministry of Agriculture and Lands has analysed the nutritient status of coconut soils soils in Solomon Islands[13]:

Coconut Soils Data:
(means of soils analyses conducted on Coconut Survey soils)

pH	N%	availalble P ppm	exchangeable K meq/100g	availalble K meq/100g
6.4	0.55	70	0.24	0.60

14.12 It was concluded that coconut soils are generally high in nitrogen, medium in phosphate, and low in potassium. Recent variety experimental results on fertilised coconuts show the following yields:

Coconut Research Results (dry copra eq kg/ha):

Site	Tenaru (Guadalcanal)		Gizo (Western)	
Year	1985	1984	1985	1984
Dwarf:Rennel Hybrid	378	2,664	1,990	1,599
Dwarf:Local Tall Hybrid	383	1,391		
Local Tall			1,830	334
Rennel	190	1,391	1,910	1,052
Mean				995

14.13 16 smallholder yields of **428kg/ha** (6.11 bags/ha) were obtained in the present survey. Without further evidence yields smallholder yields in the present report are estimated to be **800kg/ha** dry copra equivalent usable nuts.

b) <u>COCOA</u>:

14.14 Research trials on cocoa[13] from 1977 to 1985 at Black Post in Guadalcanal produced a mean dry beans yield of **1,898kg/ha** for Amelonado, **2,780kg/ha** for AmlxNa33 hybrid, and **2,444kg/ha** for AmlxPa7 hybrid.

14.15 Cocoa yields from various sources are quoted in the (draft) Farm Management Handbook for Solomon Islands[24]:

Smallholder Cocoa Yields (kg/ha)[24]:

Age of tree (year)	3	4	5	6	7	8
Friend (1970)	21	126	215	220	220	173
DBSI (1983) *	150	250	600	1,200	1,450	1,450
Hiele (1988)	208	450	560	685	719	719

* unverified source

14.16 High variability in yields was attributed to differences in management, such as in the application of fertiliser, weeding, and pest and disease control.

14.17 Cocoa plantings are young and for the most part are pre-bearing. Smallholder cocoa yields are estimated in the present report to be **600kg/ha** dry beans.

c) **SWEET POTATO:**

14.18 In a study of north-west Malaita, Frazer[15] investigated the effect of fallow period on smallholder sweet potato yields. After a long fallow of 15-20 years the mean yield was found to be **14.84MT/ha** from 8 observations. After a "short" fallow of less than 10 years the mean yield was **8.99MT/ha** from 5 observations. Gollifer[16] looked at the effects of potassium and nitrogen application on annual crops on soils of the Dala Series in Malaita, soils formed on a parent material of raised coral reef and characteristically low in potassium. He found unfertilised sweet potato yields of **5.5MT/ha** (control for K) and **7.4MT/ha** (control for N). The effect of potassium application was to increase yields by up to 86%, but nitrogen tended to stimulate vine growth at the expense of the tuber.

14.19 In a series of trials at Dala, Gollifer[17] found unfertilised sweet potato yields to range widely, from around **0.25MT/ha** to **24MT/ha**. Yields in general were the order of **5MT/ha**, which was estimated to be around half the typical North West Guadalcanal yield of **9.97MT/ha**. Yield variability could not be attributed to variety or soil type, but a trend related to intensity of cropping did appear:

Effect of Recent Land History on Sweet Potato Yields (MT/ha):

land history	yield (MT/ha)
continuous cropping	3.51
0 - 4 years fallow	4.77
5 - 9 years fallow	6.03
more than 10 years fallow	9.29

Source: Gollifer (1969)

14.20 It was concluded that sweet potato and other root crops are demanding of, and remove large quantities of, potassium from the soil. A fallow-burn cycle is therefore essential to replenish soil fertility by making potassium available to shallow-rooted crops. It was considered that deep rooting trees may act as nutrient pumps, but the only practical way of shortening fallow periods was considered to be the application of potassium fertiliser[17].

14.21 Bathgate[18] found also that yields vary according to soil fertility and growing time, as well as species and density of planting. In West Guadalcanal he quotes sweet potato yields of **7.16MT/ha** after 20 years of fallow and **9.36MT/ha** after 8 years of fallow, but based on a single sub-plot observation only in each case.

14.22 On the weather coast of Guadalcanal Chapman and Pirie[19] studied the relationship between yields and cropping, and found yields to be high in comparison to studies elsewhere:

Sweet Potato Yield (MT/ha) - Weather Coast, Guadalcanal

successive crops	Ghauvalisi	Sughu	Hatare/Poinaho
1	41.67	18.08	17.32
2	15.31	10.54	9.79
3		10.29	9.79

Source: Chapman and Pirie (1974)

14.23 In the 1974-75 Agricultural Survey[5] the mean yield of sweet potato was 15.7**MT/ha**, but this was felt to be an over-estimate.

14.24 More recent research provide further information on sweet potato yields, but results exhibit considerable variability across seasons and due to other causes:

trial	yield MT/ha		notes
	gross	marketable	
improved cultivars	17.9	14.5	25 obs
control	11.2	6.7	1 obs
dry season corn intercropping	15.9	7.1	135 days to harvest
	18.5	12.0	165 days to harvest
wet season corn intercropping	5.9	1.5	135 days to harvest
	11.0	3.4	165 days to harvest
dry season weevil control	15.3		no effect from insecticide
wet season weevil control	8.19	6.37	

Source: Research Department Annual Report 1984[14] and 1985[13]

14.25 Smallholder sweet potato yields of usable crop are estimated in the present report to be **8MT/ha** under long fallow of 8 years or more - falling to **5MT/ha** for fallow of 4 to 8 years, and **3.5MT/ha** for short fallow cropping.

d) <u>TARO</u>:

14.26 Taro yields in the literature are highly variable. Frazer[15] found <u>Colocasia esculenta</u> to yield **8.94MT/ha** in North Malaita, based on 10 observations. Gollifer[16] on the Dala Series in Malaita found yields of **4.0MT/ha** for unfertilised taro, which increased to **6.0MT/ha** with 168kg/ka potassium fertiliser applied. Gollifer[17] also quotes widely ranging unfertilised taro yields of **1.00** to **10.80MT/ha** on experimental plots. In a spacing trial in Guadalcanal at Tenaru on which fertiliser was applied, the net undamaged taro yield for densities of 2,000 to 4,000 plants/ha was around **5MT/ha**, with 30% loss due to corm

damage[14]. On the same site a high intensity inputs and management trial to investigate leaf blight yielded around **9MT/ha** marketable corms[14]. The control yield in a 1985 taro beetle trial at Tenaru was **3.49MT/ha**[13]. Tioti (1967) estimated taro yields to be **12.6MT/ha**[25], but Gollifer (1970) quotes yields of **4.7MT/ha**[26].

14.27 No taro yields were obtained in the present survey. Smallholder taro yield in the present report is estimated to be **5MT/ha.**

e) **YAM**:

14.28 In North Malaita Frazer[15] found yam yields of **5.16MT/ha** for Dioscorea alata. Gollifer[17] quotes unfertilised yam yields of **6.03MT/ha** to **30.38MT/ha** at Dala experimental station on Malaita. In 1984 an experiment to compare the yields of 18 yam cultivars was conducted at Tenaru in Guadalcanal[14] in which the cultivars with high resistance to dieback yielded around **14** to **18MT/ha**, with the highest resistance cultivar yielding **24MT/ha.** Susceptible cultivars produced yields as low as **2MT/ha.** Maeinia[27] quotes very high yields of **50 - 63MT/ha** for Malaita.

14.29 Smallholder yam yields are likely to be higher than those of sweet potato given that they tend to be planted on newly opened sites. Long term fallow is expected to yield **10MT/ha**, fallow of 4-8 years to yield **6MT/ha** and short fallow systems to yield **4MT/ha.**

f) **PANA**:

14.30 Frazer[15] quotes a for North Malaita, where on one observation only of Dioscorea esculenta produced a yield of **11.52MT/ha**. Fertilised cultivar trials at Dodo Creek Research Station[14] in 1984 yielded **16.2MT/ha** marketable tubers out of a total yield of **27.7MT/ha**. 1983 results were higher, with **43.7MT/ha** marketable tubers out of a total yield of **52.9MT/ha**. The difference was believed to be due to inadequate fertiliser in 1984. In 1985 the mean fertilised yield of 8 cultivars was **24.3MT/ha** marketable tubers[13].

14.31 Smallholder pana yields are expected to be similar to yam yields - of **10MT/ha** under long fallow, **6MT/ha** under 4-8 years fallow, and **4MT/ha** under short fallow.

g) **CASSAVA**:

14.32 Fertilised cassava in a time of harvest trial at Dodo Creek in Guadalcanal[13] yielded **23.8MT/ha** after 9 months and **27.8MT/ha** after 12 months. In a fertilised germplasm collection trial on the Fataolo land system on Malaita 17 cultivars ranged from 7.5 to **65.8MT/ha**, with 50% above 40MT/ha[28].

14.33 Smallholder yields in general are estimated to be **10MT/ha**.

h) **MAIZE**:

14.34 Gollifer[16] quotes unfertilised maize yields of **1.90MT/ha** on Dala soils in Malaita, but yields of **5.58MT/ha** when fertilised with NPK. Further unfertilised maize yield data from Dala[17] range from **1.55MT/ha** to **2.13MT/ha**.

14.35 Smallholder maize yields in the present report are estimated to be **1.8MT/ha**.

i) **GROUNDNUT**:

14.36 Gollifer quotes unfertilised groundnut yields in the range **527kg/ha** to **1,278kg/ha** from Dala in Malaita.

14.37 Smallholder groundnut yields in the present report are estimated to be **600kg/ha.**

k) **SUMMARY OF YIELDS**:

14.38 Crop yields derived fromthe survey and secondary sources are necessarily imprecise because of the complexity of smallholder farming systems. Diverse crop mixtures, with varying crop densities and differing site conditions do not lend themselves to a simple analysis of crop yields or smallholder production. Crop yields in the literature are generally for pure stand crops, or very simple mixtures - under controlled or even modified conditions. There is then a need to study smallholder production under more realistic conditions, as is part of the on-going programme of the Agricultural Economics Section. In the meantime, a "best estimate" of typical smallholder yields in the project area is presented in table 14.5.

Table: 14.5
SMALLHOLDER CROP YIELDS

crop	condition	yield kg/ha
coconut	copra equivalent	800
cocoa	dry beans	600
sweet potato	> 8 years fallow	8,000
	4 - 8 years fallow	5,000
	< 4 years fallow	3,500
taro		5,000
yam	> 8 years fallow	10,000
	4 - 8 years fallow	6,000
	< 4 years fallow	4,500
pana	> 8 years fallow	10,000
	4 - 8 years fallow	6,000
	< 4 years fallow	4,500
cassava		10,000
maize		1,800
groundnuts		600

Chapter: 15
SMALLHOLDER PRODUCTION

15.1 Under the Rural Services "Project Benificiary Monitoring and Evaluation" undertaken by the Statistics Office, gross crop offtake and other primary production were measured on six of the Rural Development Centre sites. Western Province was not included in the PBME study and so results are not presented here.

15.2 From table 9.2 the average root crop area in the survey area is **0.112ha** of which sweet potato is dominant on **0.108ha**. All crops occur in complex mixtures, so that simple cropping patterns can only be used as a first approximation for the actual crop coverage.

15.3 Table 15.1 is a summary of available production data from the farming systems survey. It is not possible to directly relate aggregate production data to average cropping patterns until a more detailed analysis of smallholder production is available.

Table: 15.1
SMALLHOLDER PRODUCTION SUMMARY

commodity	area (ha)	growing period (months)	annual production (kg)
sweet potato	0.108	4.2	
cassava	0.001	6.0	
yam	0.001	4.0	
pana	0.002	7.2	
taro			
breadfruit			
banana			
Source table:	9.2	11.3	

Chapter: 16
LABOUR

16.1 With little or no cash inputs applied the main component in the socio-economy of smallholder agriculture is labour. Table 16.1 presents an overview of labour constraints expressed by farmers. The first part of the table shows the frequency of gardens affected and is expressed in terms of area affected in the second part. Labour constarints are illustrated in diagram 16.1.

Table: 16.1
LABOUR CONSTRAINTS

i) Labour Constraints by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no limitation		9		38	47
lack of labour		5		8	13
lack of inputs/cash		1		1	2
lack of labour + cash		2			2
garden too far from house					
garden too far + labour					
garden too far + cash					
too far + labour + cash					
total by crop type		17		47	64

ii) Labour Constraints by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no limitation		43		11	54
lack of labour		35		3	38
lack of inputs/cash		5			5
lack of labour + cash		3			3
garden too far from house					
garden too far + labour					
garden too far + cash					
too far + labour + cash					
total by crop type		86		14	100

Note: The table of % area is only approximate due to rounding small numbers

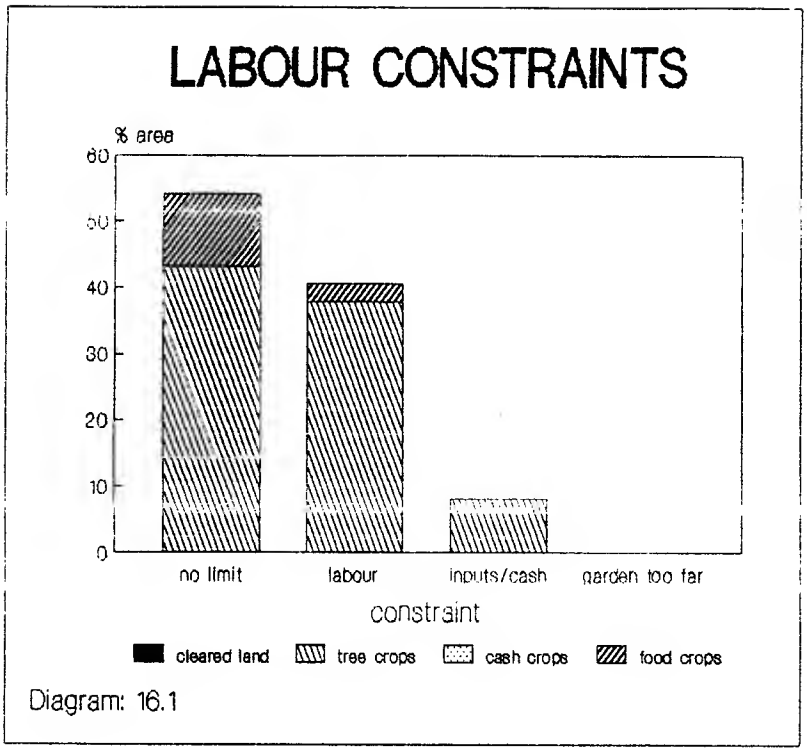


Diagram: 16.1

16.2 **73%** of gardens on **54%** of the farmed area have no important constraints, due to a high proportion of very small holdings and a small overall mean holding size. The dominant constraints are on tree crops, and the dominant constraints are labour and inputs and cash rather than distance of gardens from the household. A summary of constraints expressed as percentages of gardens by each crop type [and in brackets as the corresponding % area] is as follows:

limitation	<---------- garden type ---------->			
	tree crops		short term cash crops	food crops
No limitation	53	[50]		81 [79]
Lack of labour	41	[44]		17 [21]
Lack of inputs	18	[9]		2
Garden too far				

16.3 Table 16.2 summarises the labour requirements of the average holding, derived from individual plot labour studies presented in annex 2. The table is a "model" budget representing the average of complex and diverse holdings. Individual crop budgets in annex 2 may be used to construct farm budgets for hypothetical holdings, but caution should be exercised where there are few observations. Labour days in budgets presented here are based on actual hours worked per day, which are quite variable. Again, tables in annex 2 may be used to convert work hours into "standard" work days if required. Since table 16.2 represents the average holding, crops which comprise only minor mixtures in cropping patterns do not appear in the summary labour budget.

16.4 The table shows the labour requirement of each agricultural operation according to crop, which may be a pure stand or more commonly the dominant crop in a mixture. Agricultural operations cover: land clearance; cultivation; planting; first, second and third weeding; and harvesting. For some crops - notably, but not exclusively, trees - there may be additional operations such as pruning or thinning which do not easily fall within the standard classification. Two general categories of establishment and maintenance operations are therefore included. Such a classification provides good coverage for most activities and allows diverse crops to be handled in a standard manner.

16.5 In the interpretation of labour budgets it should be remembered that only tree cropping farmers will require labour on tree crops while non-tree cropping farmers will not require any. Labour budgets are also presented on the basis of labour input "when operations are performed". Adjustment is not made to the labour input to take account of operations which are omitted. By referring to annex 2 adjustments may be made to budgets based on different assumptions about management intensity. Incorporating this into the present analysis would considerably increase the complexity of presentation and introduce ambiguity into the results.

Table: 16.2
ANNUAL LABOUR INPUT BY HOLDING

	work days per year per holding				per ha	% contribution			labour cost
	men	women	paid	total	average	men	women	paid	(SI$)
i) Land Clearance									
Cleared Land	2	1		3	441	67	33		
Coconut									
Cocoa	6			6	19	100			
Grain Crops									
Cabbage									
Vegetable					286				
Sweet Potato	24	11	1	36	337	67	31	3	10
Taro									
Pana					446				
Cassava									
Total holding	32	12	1	45	342	71	27	2	10
ii) Cultivation									
Cleared Land					400				
Coconut									
Cocoa					15				
Grain Crops					67				
Cabbage					290				
Vegetable					408				
Sweet Potato	28		2	30	666	93		7	13
Taro									
Pana					165				
Cassava									
Total holding	28		2	30	567	93		7	13
iii) Planting									
Cleared Land									
Coconut									
Cocoa	5	7		12	35	42	58		
Grain Crops					67				
Cabbage					759				
Vegetable									
Sweet Potato	9	28		37	346	24	76		2
Taro					333				
Pana					178				
Cassava		2		2	1875		100		
Total holding	14	37		51	389	27	73		2

ANNUAL LABOUR INPUT BY HOLDING (continued)

	⟨------ work days per year -----⟩					⟨- % contribution -⟩			labour
	⟨----- per holding -----⟩				per ha				cost
	men	women	paid	total	average	men	women	paid	(I)
iv) Establishment									
Cleared Land									
Coconut	42		5	47	98	89		11	5
Cocoa	1			1	2	100			
Grain Crops									
Cabbage									
Vegetable									
Sweet Potato									
Taro									
Pana									
Cassava									
Total holding	43		5	48	43	90		10	5
v) Maintenance									
Cleared Land									
Coconut	33	21	4	58	121	57	36	7	2
Cocoa	22			22	90	100			
Grain Crops									
Cabbage									
Vegetable									
Sweet Potato									
Taro									
Pana									
Cassava									
Total holding	55	21	4	80	119	69	26	5	2
vi) First Weeding									
Cleared Land									
Coconut	4	1		5	9	80	20		
Cocoa									
Grain Crops									
Cabbage									
Vegetable									
Sweet Potato	11	34		45	146	24	76		3
Taro									
Pana					199				
Cassava		4		4	3750		100		
Total holding	15	39		54	419	28	72		3

ANNUAL LABOUR INPUT BY HOLDING (continued)

	work days per year: per holding: men	women	paid	total	per ha average	% contribution: men	women	paid	labour cost (I)
vii) Second Weeding									
Cleared Land									
Coconut	6	1	3	10	21	60	10	30	2
Cocoa									
Grain Crops									
Cabbage									
Vegetable									
Sweet Potato	7	39		46	432	15	85		4
Taro									
Pana					226				
Cassava		1		1	1446		100		
Total holding	13	41	3	57	444	23	72	5	6
viii) Third Weeding									
Cleared Land									
Coconut	4	1		5	9	80	20		
Cocoa									
Grain Crops									
Cabbage									
Vegetable									
Sweet Potato									
Taro									
Pana									
Cassava									
Total holding	4	1		5	34	80	20		
ix) Harvesting									
Cleared Land									
Coconut	6	9		15	31	40	60		
Cocoa									
Grain Crops									
Cabbage									
Vegetable									
Sweet Potato	6	203		209	1937	3	97		
Taro									
Pana		2		2	824		100		
Cassava									
Total holding	12	214		226	1493	5	95		

16.6 On land clearance sweet potatoi accounts for 80% of labour expended, requiring 36 work days per year. Coconuts account for a further 13% of labour expended, requiring 6 days. Of 45 work days, men contribute 71%, women 27% and paid labour accounts for 2%.

16.7 Land cultivation requires 30 days, mainly on root crops. Men contribute 93% and hired labour accounts for 7%.

16.8 76% of the labour expended in planting is on root crops, mainly sweet potato, accounting for 39 work days per year, with a further 12 work days, or 24% of the labour budget on cocoa. Of 51 work days per year required on planting men contribute 27% while women contribute 73%. Tasks are shared fairly evenly by gender although women perform most of the planting of root crops.

16.9 128 days per year are expended on the establishment and maintenance of coconuts on which men contribute most of the labour on coconuts and all of the labour on cocoa. Overall women contribute 16% of labour on tree crops establishment and maintenance.

16.10 54 work days are spent on the first weeding of crops, of which 45 days are on sweet potato. Women account for 67% of the labour on first weeding and men contribute 28%

16.11 57 work days are spent on the second weeding of crops, which is mainly on sweet potato. Men provide 23% of the labour on second weeding and women provide 72%, with a further 5% accounted for by hired labour. An additional 5 days are expended on the third weeding of coconuts, provided mainly by men.

16.12 Harvesting is the major operation requiring 226 work days, mainly on sweet potato. Only 5% of harvesting labour is provided by men and 95% is provided by women..

16.13 Overall men provide **36%** of labour and women provide **61%**, with 3% of farm labour accounted for by hired labour. Table 16.3 presents a summary of labour by crop and by operatior.

16.14 There are **596** work days per year required on an "average" holding of which **216** are provided by men, **365** by women and **15** by hired labour. The average adult man in the household spends **109** days working on the holding and the average adult woman spends **207** days.

Table: 16.3
SUMMARY OF LABOUR INPUT

	⟨------ work days per year -----⟩					⟨- % contribution -⟩			labour
	⟨----- per holding -----⟩				per ha				cost
	men	women	paid	total	average	men	women	paid	(I)
i) By Crop									
Cleared Land	2	1		3		67	33		
Coconut	95	33	12	140		68	24	9	9
Cocoa	34	7		41		83	17		
Grain Crops									
Cabbage									
Vegetable									
Sweet Potato	85	315	3	403		21	78	1	32
Taro					333				
Pana		2		2	2038		100		
Cassava		7		7	7071		100		
All Crops	216	365	15	596		36	61	3	41
ii) By Operation									
Land Clearance	32	12	1	45		71	27	2	10
Cultivation	28		2	30		93		7	13
Planting	14	37		51		27	73		2
Tree Crops Establishment	43		5	48		90		10	5
Tree Crops Maintenance	55	21	4	80		69	26	5	2
First Weeding	15	39		54		28	72		3
Second Weeding	13	41	3	57		23	72	5	6
Third Weeding	4	1		5		80	20		
Harvesting	12	214		226		5	95		
All Operations	216	365	15	596		36	61	3	41
Available labour units	:1.99	1.76							
Days per unit labour	: 109	207	15						

16.15 Labour by crop is illustrated in diagram 16.2. Coconuts account for 42% of the holding labour budget and sweet potato accounts for 68%.

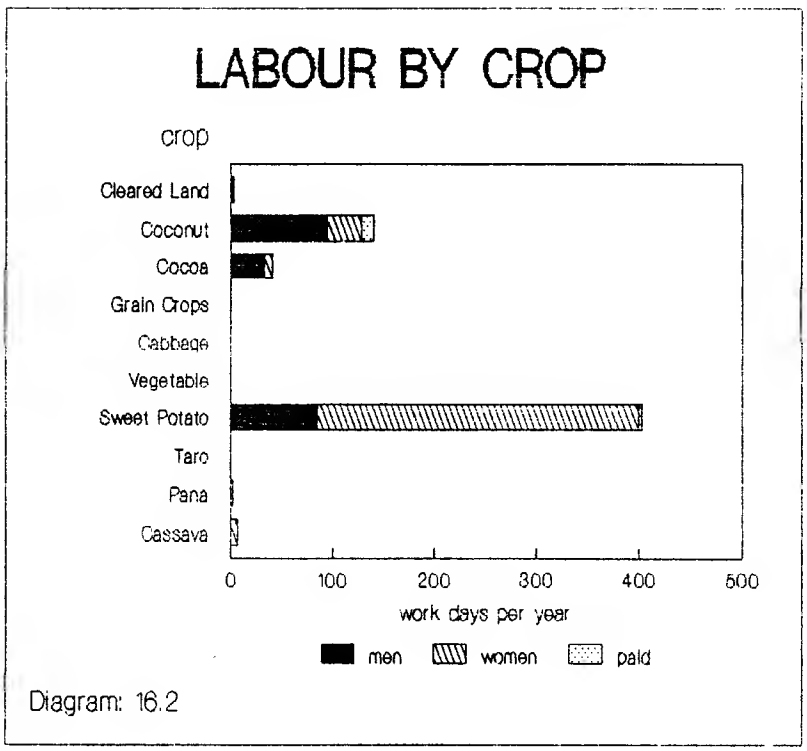


Diagram: 16.2

16.16 Labour by operation is illustrated in diagram 16.3. Men and women share most operations. Of the annual labour budget of 596 days, land clearance accounts for 8% of labour expended, cultivation accounts for 5%, planting 9%, establishment and maintenance 21%, weeding or brushing 19% and harvesting 38%.

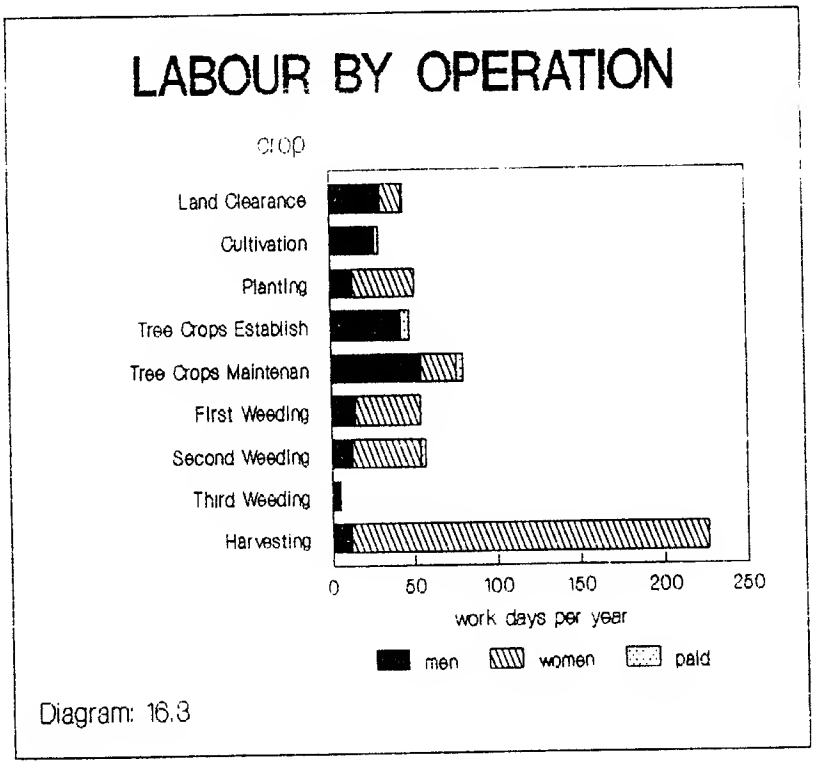


Diagram: 16.3

16.17 Diagram 16.4 illustrates the contribution from men, women and hired labour. Men contribute **36%** of labour on farm, women provide **61%** and hired labour accounts for **3%.**

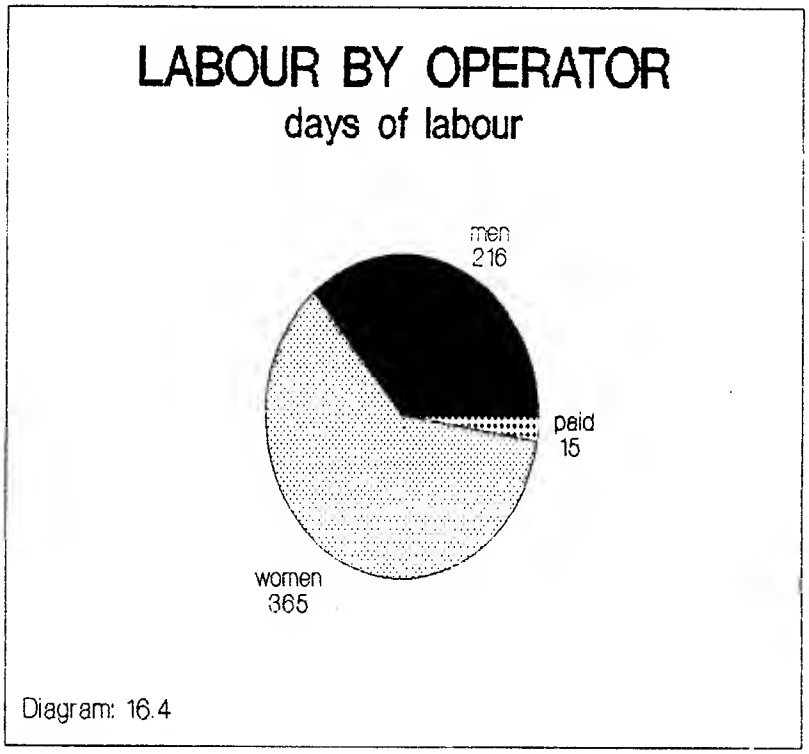


Diagram: 16.4

Chapter: 17
CROP AND FARM BUDGETS

17.1 It is not possible at this stage to produce comprehensive crop and farm budgets because of the complexity and diversity of cropping patterns, and production data are as yet incomplete. The main elements are available and a summary of information on cropping patterns, production and labour is presented in Table 17.1.

Table: 17.1
ELEMENTS OF A FARM BUDGET

main crop in mixture	area (ha)	annual production (kg)	annual labour	
			work days	cost (I)
a Cleared Land	0.007		3	
b Coconut	0.481		140	9
c Cocoa	0.027		41	
z Coconut and Cocoa	0.319			
d Pasture				
e Grain Crops	0.001			
f Beans				
g Cabbage	0.001			
h Vegetables	0.001			
i Spices				
j Fruit Crops				
k Fruit trees				
l Banana				
m Citrus trees				
n Nut trees				
o Sugar cane				
p Food/building tree				
q Tobacco				
r Sweet Potato	0.108		403	32
s Taro				
t Yam	0.001			
u Pana	0.002		2	
v Cassava	0.001		7	
w Other root crop				
Total	0.899		596	41
Table reference	9.2	not available	16.3	16.3

Chapter: 18
CASH CROP PROCESSING

18.1 Table 18.1 presents a labour budget for the production of copra based on 21 observations. The labour composition is entirely family labour.

18.2 Copra manufacture requires 109 work days per annum to produce 1,120kg copra, or one work day per 10kg copra produced. 88 work days are spent on picking and shelling the nuts which account for 81% of the total production time. Firewood collection takes 6 days or 6% of the time; and drying, bagging and transport take 15 days or 14% of the time. The annual labour input is illustrated in diagram 18.1.

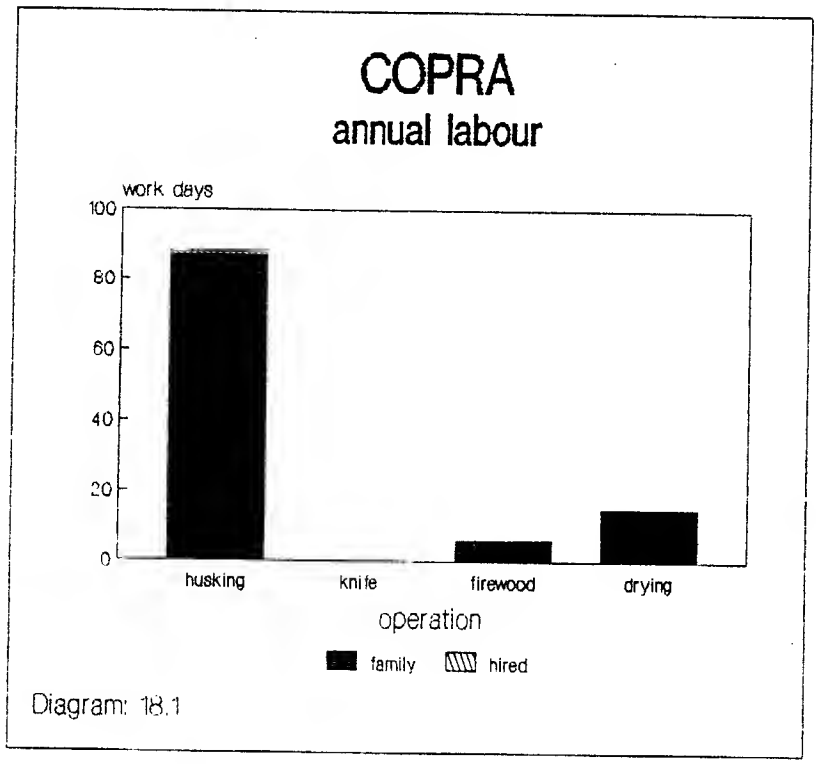


Diagram: 18.1

Table: 18.1
ANNUAL COPRA PRODUCTION AND LABOUR EXPENDITURE

Annual Labour Expenditure		family or shared labour		hired labour		total	% labour by operation
		work hours	work days	work days	cash cost ($.c)	work days	
HUSKING	picking, heaping	247.3	36.8			36.8	34
	husking	78.2	11.6	0.7	1.11	12.3	11
	transport	43.3	7.8			7.8	7
	breaking	88.8	15.8			15.8	14
	shelling	60.5	15.3			15.3	14
	total	518.2	87.3	0.7	1.1	88.0	81
COPRA KNIFE	picking, heaping						
	axing + copra knife						
	transport						
	total						
FIREWOOD	collection	10.2	2.8			2.8	3
	transport	6.7	2.1			2.1	2
	collection + transport	6.6	1.3			1.3	1
	total	23.5	6.2			6.2	6
DRYING	drying	87.6	5.7			5.7	5
	bagging	27.6	6.1			6.1	6
	transport	7.4	3.2			3.2	3
	total	122.6	15.0			15.0	14
TOTAL		664.2	108.4	0.7	1.1	109.1	100
% labour by type of labour			99	1		100	

copra grade	quantity of copra produced (kg)	
	per annum	per work day
Grade 1	1,120	10
Grade 2		
Grade 3		
Ungraded		
total	1,120	10

Number of observations = 19

18.3 The gross margin for copra production is summarised in table 18.2. From an annual production of **1,120kg** valued at the prevailing price of 33 cents per kilo the gross return is **SI$370.** Inputs costs from bags, twine and labour amount to **SI$17.42.** The net income is **SI$353** which, at a requirement of **108** household labour days, represents a net return to labour of **SI$3.26** per household work day.

Table: 18.2
COPRA GROSS MARGIN

Annual production (kg)	1,120
Price per kilogram (SI$)	0.33
Gross return (SI$)	370
Inputs cost (SI$)	16.32
Labour cost (SI$)	1.10
Net return (SI$)	353
Household labour days	108
Copra production per household work day (kg)	10
Net return per household work day (SI$)	3.26

Inputs costs: Sacks @ SI$1.00 per new sack;
Average packed weight 70kg = 16 sacks = SI$16.00.
Twine @ SI$1.00 per hank of 50 strings = SI$0.32.

18.4 No cocoa production was recorded from sampled farmers.

Chapter: 19
MARKETING

19.1 Table 19.1 presents a summary of marketing data collected in the survey, listing crops marketed against the number of observation recorded. The mean weight marketed is recorded, the time taken to go to market and back, the number of times the commodity is marketed per year, and the number of people involved in marketing. These are grouped under the heading of "marketing" details.

19.2 Marketing costs are recorded under the headings of freight or transport costs, fares for people involved in marketing, and market tax which may be imposed at the point of sale.

19.3 Revenues are possible where wages are earned, for instance from selling other farmers' produce and from the sale of crops. It is often difficult for sellers to specify costs and revenues, and in such cases data have to be treated as "missing". Thus the number of observations for crop sales may be lower than those for marketing data.

19.4 Table 19.2 is a transformation of the raw marketing data into an "average" annual marketing budget. The data are incomplete because of difficulties in recalling weights sold and marketing revenues. It is presented not as a model marketing budget, but as a data set to provide as much information on marketing as possible, albeit with gaps.

19.5 The two right-most columns show the net marketing revenue by crop and by household. The "net marketing revenue by crop" is the net return from sales after deducting costs. It is not the average income from crop sales since revenue may be negative where income data are missing or as a result of the double counting of transport costs when freight expenses are shared among several crops.

19.6 The "net marketing revenue per household" is the average household earnings taking account of the proportion of households selling each type of crop, but based on the limitations of the crop revenue data.

Table: 19.1
MARKETING TIME AND CROP PRICES

Basic Marketing Data:

		(---------- marketing ----------)					(--------- costs --------)			(-- revenues --)		
		number of obs	mean weight marketed	time to market and back	times marketed per year	number of people	freight/ transport cost	fares for people	market tax	wages earned	crop sale price	crop sale obs
		(obs)	(kg)	(days)	(times)	(people)	(I)	(I)	(I)	(I)	$'$/kg)	(obs)
ALL CROPS	Average	74	152	1.0	14	1	5.75	4.37		0.25	0.67	85
COCONUT/COCOA	Coconut	2	575	1.0	10	1		4.33			0.37	3
	Copra	16	508	0.8	3	1	22.11	4.79			0.93	19
	Dry Beans	1	300	1	12	2					1.30	1
ROOT CROPS	Sweet Potato	26	52	1.0	13	1	1.62	3.71		0.38	0.34	26
	Cassava	3	30	1.0	30	1	0.33	4.33			0.73	3
GRAIN CROPS	Corn	1	25	1.0	18	1	5.00				0.00	1
BEANS	Long Bean	2	6	1.0	20	1		5.33			0.54	3
	Snake Bean	1	10	1.0	52	1		4.00			0.50	1
CABBAGE	Hibiscus Cabbage	11	11	1.0	20	1	0.81	4.54		0.38	0.73	13
	Chinese Cabbage	3	17	1.0	25	1	0.30	3.80			0.90	5
	English Cabbage	1	86	1.0	1	1	5.00				0.24	1
VEGETABLE	Shallot	3	6	1.0	13		0.50	8.25		1.25	1.75	4
FRUIT CROPS	Pineapple	1	20	1.0	12	2		3.00			0.50	1
BANANA	Cooking Banana	2	19	1.0	12	1	1.00	6.50			0.50	2
	Sweet Banana	1	20	1.0	36	2		5.50			0.30	2
Number of households		40										

Table: 19.2
INCOME FROM MARKETING

Annual Marketing Budget:

					costs (I)				revenues (I)			net	net
		% houses marketing crop (%)	weight marketed (kg)	work days (days)	freight/ transport cost (I)	fares for people (I)	market tax (I)	total marketing costs (I)	wages earned (I)	crop sales (I)	total revenue (I)	marketing revenue by crop (I)	marketing revenue per household (I)
ALL CROPS	Average		2201	16.4	83	63		146.61	4	1471.11	1474.48	1328	166
COCONUT/COCOA	Coconut	5	5942	10.3		45		44.78		2178.80	2178.80	2134	107
	Copra	40	1694	3.9	74	16		90.59		1569.10	1569.10	1479	591
	Dry Beans	3	2400	24.0						3120.00	3120.00	3120	78
ROOT CROPS	Sweet Potato	65	697	14.4	22	50		71.16	5	236.46	241.60	170	111
	Cassava	8	900	30.0	10	130		140.00		659.70	659.70	520	39
GRAIN CROPS	Corn	3	450	18.0	90			90.00		0.23	0.23	-90	-2
BEANS	Long Bean	5	120	20.0		107		106.67		65.33	65.33	-41	-2
	Snake Bean	3	520	52.0		208		208.00		260.00	260.00	52	1
CABBAGE	Hibiscus Cabbage	28	224	20.2	16	92		108.16	8	162.70	170.48	62	17
	Chinese Cabbage	8	423	29.3	8	97		104.14		381.00	381.00	277	21
	English Cabbage	3	86	1.0	5			5.00		20.80	20.80	16	0
VEGETABLE	Shallot	8	84		7	109		115.94	17	146.94	163.50	48	4
FRUIT CROPS	Pineapple	3	240	18.0		36		36.00		120.00	120.00	84	3
BANANA	Cooking Banana	5	222	12.0	12	78		90.00		111.04	111.04	21	1
	Sweet Banana	3	720	54.0		198		198.00		216.00	216.00	13	0

19.7 Table 19.3 shows the time taken to different markets and the type of crop sold at each market. The classification of markets is subject to local interpretation, where "central" would generally be the provincial capital.

Table: 19.3
MARKET LOCATION

market location:		local	inter-mediate	central	Honiara	trading ship	% obs	number of obs
i) Time taken to market produce								
time taken to go to market and back (days)			(% observations)					
0 - .5		1	4				5	4
.5 - 1		1		94			95	81
1 - 2								
2 - 5								
5 - 10								
> 10								
% observations		2	4	94			100	
number of observations		2	3	80			85	85
mean time (days)		1		1				1.75
ii) Crops sold at different markets			(% observations)					
COCONUT/COCOA	Coconut			4			4	3
	Copra	2	4	16			22	19
	Dry Beans			1			1	1
ROOT CROPS	Sweet Potato			31			31	26
	Cassava			4			4	3
GRAIN CROPS	Corn			1			1	1
BEANS	Long Bean			4			4	3
	Snake Bean			1			1	1
CABBAGE	Hibiscus Cabbage			15			15	13
	Chinese Cabbage			6			6	5
	English Cabbage			1			1	1
VEGETABLE	Shallot			5			5	4
FRUIT CROPS	Pineapple			1			1	1
BANANA	Cooking Banana			2			2	2
	Sweet Banana			2			2	2
% observations		2	4	94			100	
number of observations		2	3	80				85

19.8 Table 19.4 summarises crop price perception and sale volumes.

Table: 19.4
CROP PRICE PERCEPTION AND SALE VOLUMES

		(---- sale price ----)			(----- sale volume -----)			number of obs
		poor	average	good	little	average	more than usual	
COCONUT/COCOA	Coconut		67	33		100		3
	Copra	16	21	63	16	84		19
	Green Beans		100			100		1
ROOT CROPS	Sweet Potato	12	77	12	15	85		26
	Cassava		67	33	33	67		3
GRAIN CROPS	Corn		100			100		1
BEANS	Long Bean		67	33		100		3
	Snake Bean		100			100		1
CABBAGE	Hibiscus Cabbage							
	Chinese Cabbage							
	English Cabbage							
VEGETABLE	Shallot							
FRUIT CROPS	Pineapple							
BANANA	Cooking Banana		100			100		2
	Sweet Banana	50	50			100		2
Number of observations		9	55	21	11	74		61

19.9 Sale volumes and prices are generally regarded as "average". Local market prices were not available in Kolombangara during the survey.

19.10 Table 19.5 summarises marketing problems. To the right of the table are the proportion of cases by severity of problem. These are combined with crop type in the body of the table to show the "index of severity". In this index "no problem" is weighted "0", "slight problem" is weighted "0.5", and "severe problem" is weighted "1.0". Thus if all cases registered a severe problem the index would be "1.0".

Table: 19.5
MARKETING PROBLEMS

Number of observations = 85

	‹--------- crop type ---------›			‹----- severity of problem -----›		
	coconut and cocoa	root crops	other crops	none	slight	severe
	(index of severity)			(% cases)		
terrain too difficult	0.0	0.0	0.0	95	4	1
distance too great	0.2	0.0	0.1	68	11	21
not enough time/labour	0.1	0.1	0.1	67	27	6
transport cost too high	0.2	0.1	0.1	49	22	28
low price at market	0.1	0.1	0.1	58	29	13
lack of transport	0.0	0.1	0.0	75	24	1
unreliable transport	0.0	0.1	0.0	76	21	2
risk of not selling enough		0.1	0.1	54	36	9
crop damage in transit	0.0	0.0		95	5	
administrative restrictions		0.0	0.0	96	4	
quarantine control				100		
other problem	0.0	0.0	0.0	93	1	6

Note: "Index of Severity is a weighted summary of severity of marketing problems.
It falls in the range 0 to 1 where 0.0 = no marketing problem
0.5 = slight marketing problem
1.0 = severe marketing problem

19.11 Transport difficulties and poor facilities at the Gizo market are major problems. "Other" problems refer to marketing in rainy weather, since the Gizo market is not covered, rough seas, and the danger of copra getting wet in transit.

Annex: 1
CROP NAMES AND CODES

A1.1 The following list describes the hierarchical coding sequence used by AES in farming systems surveys to describe crop types. The list may be added to by inserting other crops of interest within the appropriate category.

A1.2 At the garden level only broad distinctions are made between cleared land, tree crops, short term cash crops, and food crops. Only single digit numeric codes are permitted at this level and these do not distinguish between crop type or mixtures. They do, however, provide important information about the structure of the holding. Code "1" for instance specifies "tree crops".

A1.3 At the plot level alphabetical codes are used to describe crop mixtures. These are used to describe cropping patterns and the analysis of labour by crop. Letter codes are strung together so there is no pre-set limit on the complexity of mixtures described. Some simplification is introduced within the code categories themselves. The dominant crop is listed first and other crops are listed to the right in decreasing order of importance. The string code then takes the form of an alphabetical "number", where the most significant characters are to the left and the least significant to the right. Forinstance "a" specifies "cleared land", while "rvgfl" specifies a mixture in decreasing order of importance of "sweet potato, cassava, cabbage, beans, banana".

A1.4 At the yield and marketing levels it is necessary to specify exactly the crop under study, and so a unique three-digit numeric code is assigned to each crop. The list need not be complete and may be added to as necessary since "spare codes" are available. Forinstance "613" specifies "pineapple".

Table: A1.1
CROP NAMES AND CODES

garden		plot	yield and marketing		scientific name
code	name	code	code	name	
0	cleared	a	100	CLEARED (unplanted)	
1	tree crops	b	200	COCONUT	Cocos nucifera
			210	Local Tall	
			211	Rennel	
			212	Dwarf Hybrid	
			219	Other	
			250	Copra	
1	tree crops	c	300	COCOA	Theobroma cacao
			310	Cocoa green beans	
			311	Cocoa dry beans	
		d		Pasture	
3	food crops		400	ROOT CROPS	
		r	410	Sweet Potato	Ipomoea batatas
		s	411	Taro Common	Colocasia esculenta
		s	412	Giant	Alocasia micorhiza
		s	413	Hong Kong	Xanthosoma saggitifolium
		s	414	Swamp	Cytosperma chamissonis
		t	415	Yam	Dioscorea alata
		u	416	Pana	Dioscorea esculenta
		v	417	Cassava	Manihot esculenta
		w	419	Other root crop	
3	food crops	e	430	GRAIN CROPS	
			431	Corn	Zea mays
			432	Peanuts	Arachis hypogaea
			439	Other grain crop	
3	food crops	f	440	BEANS	
			441	Long bean	Phaseolus vulgaris
			442	Wing bean	Psophocarpus tetragonolobus
			443	Snake bean	Trichosanthes cucumerina
			444	Mung bean	Phaseolus aureus
			445	Pigeon pea	Cajanus cajan
			449	Other bean	

3	food crops	g	450	CABBAGE	
			451	Hibiscus cabbage	Hibiscus manihot
			452	Kangkong	
			453	Chinese cabbage	Brassica chinensis
			454	English cabbage	Brassica compestis
			455	Watercress	
			459	Other cabbage	
3	food crops	h	460	VEGETABLE	
			461	Pumpkin	Cucurbita maxima
			462	Cucumber	Cucumis sativus
			463	Shallot	Allium spp.
			464	Onion	Allium cepa
			465	Tomato	Lycopersicon esculentum
			466	Okra	Hibiscus esculentus
			467	Egg plant	Solanum melongena
			468	Green pepper (sweet)	Capsicum annuum
			479	Other vegetable	
2	short term cash crops	i	500	SPICES	
			511	Chilli pepper	Capsicum spp.
			512	Pepper corn	Piper nigrum
			513	Turmeric	Curcuma domestica
			514	Cardamom	Ellettaria cardamomum
			515	Cinnamon	Cinnamomum zeylanicum
			516	Ginger	Zingiber officinale
			517	Garlic	Allium sativum
			518	Vanilla	Vanilla fragrans
			529	Other spice	
2/3	cash/food crops	j	600	FRUIT CROPS	
			611	Water melon	Citrullus lanatus
			612	Rock melon	
			613	Pineapple	Ananas comosus
			614	Paw Paw	Carica papaya
			615	Passion fruit	Passiflora edulus f. flavicarpa
			619	Other fruit crop	
1	tree crops	k	620	FRUIT TREES	
			621	Guava	Psidium guajava
			622	Mango	Mangifera indica
			623	Soursop	
			624	Local Apple	
			625	Malayan Apple	Eugenia malaccensis
			626	Avocado	Persea americana
			629	Other fruit tree	

3	food crops	l	630	BANANA	Musa spp.
			631	Cooking banana	
			632	Sweet banana	
			639	Other banana	
1	tree crops	m	640	CITRUS TREES	
			641	Orange	Citrus sinensis
			642	Lime	Citrus aurantifolia
			643	Grapefruit	Citrus paradisi
			644	Pomelo	Citrus grandis
			649	Other citrus	
1	tree crops	n	650	NUT TREES	
			651	Ngali Nut	Canarium spp.
			652	Cut Nut	Barringtonia spp.
			653	Betel Nut	Areca catechu
			654	Cashew Nut	Anacardium occidentale
			655	Alite Nut	Terminalia catappa
			659	Other Nut	
2	short term cash crops	o	660	SUGAR CANE	
			661	Sugar cane	Saccharum spp.
			662	Pit Pit	Saccharum edule
			669	Other	
1	tree crops	p	700	FOOD/BUILDING TREE	
			701	Breadfruit	Artocarpus altilis
			702	Sago palm	Metroxylon spp.
			703	Bamboo	Nastus spp.
			709	Other tree	
2	short term cash crops	q	800	Tobacco	Nicotiana tabacum

Annex: 2
LABOUR BUDGETS

A2.1 Sunmmaries of labour in the main body of the report are derived from labour budgets shown in tables A2.1 to A2.9, each covering a major land or crop operation:

Table	Operation
A2.1	Land Clearance
A2.2	Cultivation
A2.3	Planting
A2.4	Tree Crops Establishment
A2.5	Tree Crops Maintenance
A2.6	First Weeding
A2.7	Second Weeding
A2.8	Third Weeding
A2.9	Harvesting

A2.2 Each table is divided into two sub-tables, named "a" and "b". Part "a" expresses budgets in the form of labour per hectare. Part "b" converts these results to labour per holding, based on mean holding sizes previously derived.

A2.3 Tables in "part a" are divided into two main components. Part "i" expresses "labour input by main crop growing in the plot". This is the measured labour input from field data and is derived from a subsample of plot observations. To the left of the table is the main crop type, which is the dominant crop in a mixture. In the first column of the table is the number of plots on which observations were made, and in the second column is the mean area of observed plots. The third column summarises the average number of times per year that the operation is performed in a cropping sequence, and the fourth column expresses the average number of hours worked per day.

A2.4 Within the box are labour data expressed in terms of seasonal (single crop) and annual (crop sequence) labour input, broken down by men, women and paid labour. The wage cost of paid labour is shown in the right-most column. In this, hours are converted to days by dividing by the average number of hours worked per day. This then takes account of "unproductive" time such as for travel to and from the garden, and expresses labour in terms of actual time taken. It does not, however, take account of different agricultural operations which may take place on the same day for instance where a morning might be spent clearing a plot while the afternoon is spent in weeding. Commonly work is split between the cool hours of the morning and late afternoon and so such circumstances should not generally arise.

A2.5 Below is "part ii" of the table, in which the composition of labour input is shown in more detail. The first four columns show the average number of workers in each category. Within the box is a summary of the table above, in which the % contribution of men, women and paid labour is shown.

A2.6 "Part b" of the table is on the page following "part a", in which annual labour per hectare is converted to annual labour per holding based on mean holding areas recorded for each given crop and operation - since each sub-sample will differ from the others. These are shown in the upper part of the table in two forms, as work hours and as work days by category of labour. The annual wage labour cost is shown in the far right column of the table.

A2.7 Below is the labour budget expressed in terms of time per household labour unit. In this it is assumed that communal labour is reciprocated and so balances out. Total labour input may therefore be expressed simply in terms of family labour. Wage labour is external and is therefore given the adult equivalent "weighting" of 1. Family labour is weighted according to the age composition of the family, analysed in chapter 3.

A2.8 Each set of tables for an operation is accompanied by a diagram in which the annual days of labour per holding are summarised by crop and by labour category.

A2.9 Various points should be noted about the derivation of labour budgets:

i) They are expressed in the form of "models" which are based on a sub-sample of observations. These are derived from interview, not direct measurement, although care is taken to minimise recall periods. Labour budgets are built up from a mosaic of labour records.

ii) Crop categories are summaries of complex mixtures in which the crop listed is dominant. Labour data are thus compatible with cropping pattern data and represents actual field conditions. No attempt is made to restrict or control the conditions under observation.

iii) Each table shows the labour input for an operation which is conducted. The tables do not show the extent to which operations may be missed or combined. Such refinements are difficult to include without a more complex, and therefore more costly and time consuming, survey design. The analysis therefore tends to be conservative since it does not take account of possible economies in combined operations.

iv) Caution should be exercised in interpreting results from few observations since labour data on complex systems are very variable.

v) Labour, although of central importance in the agricultural economy, is not necessarily economically optimising. Often labour has an important social character in which households will group together and "share" labour. Differences in site and labour composition, together with the social character of some labour, introduce considerable variability into results.

Table: A2.1
LABOUR OPERATIONS ON LAND CLEARANCE (per hectare)

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: men (hours/ha)	labour input: per season: women (hours/ha)	labour input: per season: paid (hours/ha)	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
i) Labour input by main crop growing in the plot											
All plots summary	:	59	0.176	1.58	4.3	687	325	32	1646	342	72.00
Cleared land	a:	7	0.025	2.29	3.7	377	340		1639	441	
Cocoa	c:	2	4.278	1.00	7.0	130			130	19	
Grain Crops	e:										
Cabbage	g:										
Vegetable	h:	2	0.005	1.00	5.0	1429			1429	286	
Sweet Potato	r:	44	0.036	1.57	5.0	720	310	43	1683	337	97.00
Taro	s:										
Pana	u:	4	0.013	1.00	3.5	769	793		1562	446	
Cassava	v:										

Note: 4.8 hours/day for banana is an assumed figure

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
ii) Labour composition								
All plots summary	:	1.2	0.4	0.5	2.1	66	31	3
Cleared land	a:	0.9	0.9		1.7	53	47	
Cocoa	c:	2.0			2.0	100		
Grain Crops	e:							
Cabbage	g:							
Vegetable	h:	1.0			1.0	100		
Sweet Potato	r:	1.2	0.3	0.6	2.2	67	29	4
Taro	s:							
Pana	u:	1.0	1.0		2.0	49	51	
Cassava	v:							

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON LAND CLEARANCE (per holding)

i) Total time worked

	mean holding area (ha)	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	work days: total	labour cost (SI$)
Total	0.948	176	60	7	33	12	1	47	10
Cleared land	0.007	6	5		2	1		3	
Cocoa	0.346	45			6			6	
Grain Crops	0.001								
Cabbage	0.001								
Vegetable	0.001	1			0			0	
Sweet Potato	0.108	122	53	7	24	11	1	36	10
Taro									
Pana	0.002	2	2		0	0		1	
Cassava	0.001								
Other	0.481								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	% contribution to family labour: men	% contribution to family labour: women
Labour units available	1.99	1.76	1.00					
Total	88	34	7	17	7	1	75	25
Cleared land	3	3		1	1		53	47
Cocoa	23			3			100	
Grain Crops								
Cabbage								
Vegetable	1			0			100	
Sweet Potato	61	30	7	12	6	1	70	30
Taro								
Pana	1	1		0	0		49	51
Cassava								

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.2
LABOUR OPERATIONS ON CULTIVATION (per hectare)

i) Labour input by main crop growing in the plot

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: hours/ha: men	labour input: per season: hours/ha: women	labour input: per season: hours/ha: paid	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
All plots summary	:	57	0.178	1.63	4.0	847	507	41	2276	567	101.95
Cleared land	a:	1	0.005	1.00	6.0	2400			2400	400	
Cocoa	c:	2	4.278	1.00	7.0	108			108	15	
Grain Crops	e:	1	0.015	1.00	2.0	133			133	67	
Cabbage	g:	1	0.007	1.00	2.0	580			580	290	
Vegetable	h:	1	0.005	1.00	4.0	1633			1633	408	
Sweet Potato	r:	48	0.032	1.75	4.0	885	589	49	2665	666	121.07
Taro	s:										
Pana	u:	3	0.014	1.00	3.0	285	210		495	165	
Cassava	v:										

Note: 4.8 hours/day for banana is an assumed figure

ii) Labour composition

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
All plots summary	:	1.0	0.3	0.5	2.4	61	36	3
Cleared land	a:	1.0			1.0	100		
Cocoa	c:	2.0			2.0	100		
Grain Crops	e:	1.0			1.0	100		
Cabbage	g:	1.0			1.0	100		
Vegetable	h:	1.0			1.0	100		
Sweet Potato	r:	1.0	0.9	0.6	2.5	58	39	3
Taro	s:							
Pana	u:	1.0	0.7		1.7	58	42	
Cassava	v:							

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON CULTIVATION (per holding)

i) Total time worked

		mean holding area (ha)	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	work days: total	labour cost (SIS)
Total	:	0.948	224	112	9	51	28	2	81	13
Cleared land	:	0.007	17			3			3	
Cocoa	:	0.346	37			5			5	
Grain Crops	:	0.001	0			0			0	
Cabbage	:	0.001	1			0			0	
Vegetable	:	0.001	2			0			0	
Sweet Potato	:	0.108	167	111	9	42	28	2	72	13
Taro	:									
Pana	:	0.002	1	0		0	0		0	
Cassava	:	0.001								
Other		0.481								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	% contribution to family labour: men	% contribution to family labour: women
Labour units available	1.99	1.76	1.00					
Total	113	63	9	26	16	1	67	33
Cleared land	8			1			100	
Cocoa	19			3			100	
Grain Crops	0			0			100	
Cabbage	0			0			100	
Vegetable	1			0			100	
Sweet Potato	84	63	9	21	16	1	60	40
Taro								
Pana	0	0		0	0		58	42
Cassava								

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.3
LABOUR OPERATIONS ON PLANTING (per hectare)

i) Labour input by main crop growing in the plot

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season hours/ha men	women	paid	per year hours (hrs/ha)	days (d/ha)	labour cost ($/ha/yr)
All plots summary	:	57	0.183	1.63	4.1	229	731	7	1578	389	15.02
Cleared land	a:										
Cocoa	c:	2	4.278	1.00	7.0	108	135		243	35	
Grain Crops	e:	1	0.015	1.00	1.0	67			67	67	
Cabbage	g:	3	0.007	1.00	3.3	1477	1053		2530	759	
Vegetable	h:										
Sweet Potato	r:	46	0.039	1.78	4.1	180	601	9	1408	346	18.62
Taro	s:	1	0.006	1.00	6.0		2000		2000	333	
Pana	u:	3	0.014	1.00	3.0	174	360		534	178	
Cassava	v:	1	0.002	1.00	4.0		7500		7500	1875	

Note: 4.8 hours/day for banana is an assumed figure

ii) Labour composition

		average number of workers: men	women	paid	total	% contribution: men	women	paid
All plots summary	:	0.4	1.4	0.2	2.1	24	76	1
Cleared land	a:							
Cocoa	c:	2.0	2.0		4.0	44	56	
Grain Crops	e:	1.0			1.0	100		
Cabbage	g:	1.0	0.3		1.3	58	42	
Vegetable	h:							
Sweet Potato	r:	0.3	1.5	0.3	2.1	23	76	1
Taro	s:		2.0		2.0		100	
Pana	u:	0.3	1.3		1.7	33	67	
Cassava	v:		3.0		3.0		100	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON PLANTING (per holding)

i) Total time worked

	mean holding area (ha)	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	work days total	labour cost (SIS)
Total	0.948	74	172	2	14	38	0	52	2
Cleared land	0.007								
Cocoa	0.346	37	47		5	7		12	
Grain Crops	0.001	0			0			0	
Cabbage	0.001	1	1		0	0		1	
Vegetable	0.001								
Sweet Potato	0.108	35	116	2	9	28	0	37	2
Taro									
Pana	0.002	0	1		0	0		0	
Cassava	0.001		8			2		2	
Other	0.481								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	% contribution to family labour men	% contribution to family labour women
Labour units available	1.99	1.76	1.00					
Total	37	98	2	7	21	0	30	70
Cleared land								
Cocoa	19	27		3	4		44	56
Grain Crops	0			0			100	
Cabbage	1	1		0	0		58	42
Vegetable								
Sweet Potato	17	66	2	4	16	0	23	77
Taro								
Pana	0	0		0	0		33	67
Cassava		4			1			100

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.4
LABOUR OPERATIONS ON ESTABLISHMENT (per hectare)

i) Labour input by main crop growing in the plot

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: hours/ha: men	labour input: per season: hours/ha: women	labour input: per season: hours/ha: paid	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
All plots summary	:	3	0.861	1.00	4.7	181		19	200	43	8.00
Cleared land	a:										
Coconut	b:	2	1.013	1.00	3.0	264		29	293	98	11.00
Cocoa	c:	1	0.557	1.00	8.0	14			14	2	
Grain Crops	e:										
Cabbage	g:										
Vegetable	h:										
Sweet Potato	r:										
Taro	s:										
Pana	u:										
Cassava	v:										

Note: 4.8 hours/day for banana is an assumed figure

ii) Labour composition

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
All plots summary	:	2.3		5.0	7.3	91		10
Cleared land	a:							
Coconut	b:	3.0		7.5	10.5	90		10
Cocoa	c:	1.0			1.0	100		
Grain Crops	e:							
Cabbage	g:							
Vegetable	h:							
Sweet Potato	r:							
Taro	s:							
Pana	u:							
Cassava	v:							

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON ESTABLISHMENT (per holding)

i) Total time worked

	mean holding area (ha)	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	work days: total	labour cost (SI$)
Total	0.948	132		14	43		5	48	5
Cleared land	0.007								
Coconut	0.481	127		14	42		5	47	5
Cocoa	0.346	5			1			1	
Grain Crops	0.001								
Cabbage	0.001								
Vegetable	0.001								
Sweet Potato	0.108								
Taro									
Pana	0.302								
Cassava	0.001								
Other									

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	% contribution to family labour: men	% contribution to family labour: women
Labour units available	1.99	1.76	1.00					
Total	66		14	22		3	100	
Cleared land								
Coconut	64		14	21		3	100	
Cocoa	2			0			100	
Grain Crops								
Cabbage								
Vegetable								
Sweet Potato								
Taro								
Pana								
Cassava								

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.5
LABOUR OPERATIONS ON MAINTENANCE (per hectare)

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: men	labour input: per season: women	labour input: per season: paid	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
i) Labour input by main crop growing in the plot											
All plots summary	:	6	2.912	4.17	5.3	82	61	10	636	119	3.81
Cleared land	a:										
Coconut	b:	5	1.894	3.80	5.2	93	61	11	629	121	4.57
Cocoa	c:	1	8.000	6.00	6.0	27	63		540	90	
Grain Crops	e:										
Cabbage	g:										
Vegetable	h:										
Sweet Potato	r:										
Taro	s:										
Pana	u:										
Cassava	v:										

Note: 4.8 hours/day for banana is an assumed figure

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
ii) Labour composition								
All plots summary	:	4.5	3.3	2.5	10.3	54	40	6
Cleared land	a:							
Coconut	b:	4.8	2.6	3.0	10.4	56	37	7
Cocoa	c:	3.0	7.0		10.0	30	70	
Grain Crops	e:							
Cabbage	g:							
Vegetable	h:							
Sweet Potato	r:							
Taro	s:							
Pana	u:							
Cassava	v:							

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON MAINTENANCE (per holding)

i) Total time worked

	mean holding area (ha)	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	work days total	labour cost (SI$)
Total	0.948	226	242	21	42	43	4	89	2
Cleared land	0.007								
Coconut	0.481	170	111	21	33	21	4	58	2
Cocoa	0.346	56	131		9	22		31	
Grain Crops	0.001								
Cabbage	0.001								
Vegetable	0.001								
Sweet Potato	0.108								
Taro									
Pana	0.002								
Cassava	0.001								
Other									

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	% contribution to family labour men	% contribution to family labour women
Labour units available	1.99	1.76	1.00					
Total	114	138	21	21	25	2	48	52
Cleared land								
Coconut	85	63	21	16	12	2	60	40
Cocoa	28	74		5	12		30	70
Grain Crops								
Cabbage								
Vegetable								
Sweet Potato								
Taro								
Pana								
Cassava								

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.6
LABOUR OPERATIONS ON FIRST WEEDING (per hectare)

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: hours/ha: men	labour input: per season: hours/ha: women	labour input: per season: hours/ha: paid	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
i) Labour input by main crop growing in the plot											
All plots summary	:	43	0.135	2.07	4.9	202	777	5	2036	419	23.03
Cleared land	a:										
Coconut	b:	2	2.227	1.00	6.0	44	10		54	9	
Cocoa	c:										
Grain Crops	e:										
Cabbage	g:										
Vegetable	h:										
Sweet Potato	r:	37	0.036	2.22	4.9	222	701	5	2057	416	26.76
Taro	s:										
Pana	u:	3	0.014	1.00	3.7	131	598		729	199	
Cassava	v:	1	0.002	2.00	3.0		5625		11250	3750	

Note: 4.8 hours/day for banana is an assumed figure

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
ii) Labour composition								
All plots summary	:	0.4	1.2	0.0	1.7	21	79	0
Cleared land	a:							
Coconut	b:	1.5	1.0		2.5	81	19	
Cocoa	c:							
Grain Crops	e:							
Cabbage	g:							
Vegetable	h:							
Sweet Potato	r:	0.4	1.2	0.1	1.6	24	76	1
Taro	s:							
Pana	u:	0.3	1.3		1.7	18	82	
Cassava	v:		3.0		3.0		100	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON FIRST WEEDING (per holding)

i) Total time worked

	mean holding area (ha)	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	work days: total	labour cost (SIS)
Total :	0.948	75	185	1	14	39	0	53	3
Cleared land :	0.007								
Coconut :	0.481	21	5		4	1		4	
Cocoa :	0.346								
Grain Crops :	0.001								
Cabbage :	0.001								
Vegetable :	0.001								
Sweet Potato :	0.108	53	168	1	11	34	0	45	3
Taro :									
Pana :	0.002	0	1		0	0		0	
Cassava :	0.001		11			4		4	
Other									

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	% contribution to family labour: men	% contribution to family labour: women
Labour units available	1.99	1.76	1.00					
Total	37	105	1	7	22	0	29	71
Cleared land								
Coconut	11	3		2	0		81	19
Cocoa								
Grain Crops								
Cabbage								
Vegetable								
Sweet Potato	27	95	1	5	19	0	24	76
Taro								
Pana	0	1		0	0		18	82
Cassava		6			2			100

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.7
LABOUR OPERATIONS ON SECOND WEEDING (per hectare)

i) Labour input by main crop growing in the plot

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: men (hours/ha)	per season: women (hours/ha)	per season: paid (hours/ha)	per year: hours (hrs/ha)	per year: days (d/ha)	labour cost ($/ha/yr)
All plots summary	:	32	0.228	2.31	4.9	108	826	7	2177	444	31.41
Cleared land	a:										
Coconut	b:	3	2.151	1.67	4.0	30	7	13	83	21	5.00
Cocoa	c:										
Grain Crops	e:										
Cabbage	g:										
Vegetable	h:										
Sweet Potato	r:	26	0.030	2.50	5.2	130	759	8	2242	432	38.08
Taro	s:										
Pana	u:	1	0.018	1.00	4.0		904		904	226	
Cassava	v:	2	0.010	1.50	3.0		2891		4337	1446	

Note: 4.8 hours/day for banana is an assumed figure

ii) Labour composition

		average number of workers: men	women	paid	total	% contribution: men	women	paid
All plots summary	:	0.3	1.3	0.2	1.8	11	88	1
Cleared land	a:							
Coconut	b:	1.0	0.7	1.7	3.3	61	14	25
Cocoa	c:							
Grain Crops	e:							
Cabbage	g:							
Vegetable	h:							
Sweet Potato	r:	0.3	1.2	0.1	1.6	14	85	1
Taro	s:							
Pana	u:		2.0		2.0		100	
Cassava	v:		2.0		2.0		100	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON SECOND WEEDING (per holding)

i) Total time worked

	mean holding area (ha)	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	work days total	labour cost (SI$)
Total	0.948	59	217	12	13	43	3	58	7
Cleared land	0.007								
Coconut	0.481	24	6	10	6	1	3	10	2
Cocoa	0.346								
Grain Crops	0.001								
Cabbage	0.001								
Vegetable	0.001								
Sweet Potato	0.108	35	205	2	7	39	0	47	4
Taro									
Pana	0.002		2			0		0	
Cassava	0.001		4			1		1	
Other									

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	% contribution to family labour men	% contribution to family labour women
Labour units available	1.99	1.76	1.00					
Total	30	123	12	6	24	2	21	79
Cleared land								
Coconut	12	3	10	3	1	1	81	19
Cocoa								
Grain Crops								
Cabbage								
Vegetable								
Sweet Potato	18	116	2	3	22	0	15	85
Taro								
Pana		1			0			100
Cassava		2			1			100

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.8
LABOUR OPERATIONS ON THIRD WEEDING (per hectare)

i) Labour input by main crop growing in the plot

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season men (hours/ha)	labour input: per season women (hours/ha)	labour input: per year paid (hrs/ha)	labour input: per year days (d/ha)	labour cost ($/ha/yr)
All plots summary	:	2	2.227	1.00	6.0	44	10	54	9	
Cleared land	a:									
Coconut	b:	2	2.227	1.00	6.0	44	10	54	9	
Cocoa	c:									
Grain Crops	e:									
Cabbage	g:									
Vegetable	h:									
Sweet Potato	r:									
Taro	s:									
Pana	u:									
Cassava	v:									

Note: 4.8 hours/day for banana is an assumed figure

ii) Labour composition

		average number of workers: men	women	paid	total	% contribution: men	women	paid
All plots summary	:	1.5	1.0		2.5	82	18	
Cleared land	a:							
Coconut	b:	1.5	1.0		2.5	82	18	
Cocoa	c:							
Grain Crops	e:							
Cabbage	g:							
Vegetable	h:							
Sweet Potato	r:							
Taro	s:							
Pana	u:							
Cassava	v:							

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON THIRD WEEDING (per holding)

i) Total time worked

	mean holding area (ha)	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	work days total	labour cost (SI$)
Total	0.948	21	5		4	1		4	
Cleared land	0.007								
Coconut	0.481	21	5		4	1		4	
Cocoa	0.346								
Grain Crops	0.001								
Cabbage	0.001								
Vegetable	0.001								
Sweet Potato	0.108								
Taro									
Pana	0.002								
Cassava	0.001								
Other									

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	% contribution to family labour men	% contribution to family labour women
Labour units available	1.99	1.76	1.00					
Total	11	3		2	0		82	18
Cleared land								
Coconut	11	3		2	0		82	18
Cocoa								
Grain Crops								
Cabbage								
Vegetable								
Sweet Potato								
Taro								
Pana								
Cassava								

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.9
LABOUR OPERATIONS ON HARVESTING (per hectare)

i) Labour input by main crop growing in the plot

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: hours/ha: men	labour input: per season: hours/ha: women	labour input: per season: hours/ha: paid	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
All plots summary	:	22	0.100	2.95	1.5	19	716		2172	1493	
Cleared land	a:										
Coconut	b:	2	0.808	5.00	4.0	10	15		125	31	
Cocoa	c:										
Grain Crops	e:										
Cabbage	g:										
Vegetable	h:										
Sweet Potato	r:	18	0.031	2.94	1.2	22	782		2367	1937	
Taro	s:										
Pana	u:	2	0.014	1.00	1.0		824		824	824	
Cassava	v:										

Note: 4.8 hours/day for banana is an assumed figure

ii) Labour composition

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
All plots summary	:	0.1	1.2		1.3	3	97	
Cleared land	a:							
Coconut	b:	1.0	1.5		2.5	40	60	
Cocoa	c:							
Grain Crops	e:							
Cabbage	g:							
Vegetable	h:							
Sweet Potato	r:	0.1	1.1		1.2	3	97	
Taro	s:							
Pana	u:		1.5		1.5		100	
Cassava	v:							

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON HARVESTING (per holding)

i) Total time worked

	mean holding area (ha)	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	work days total	labour cost (SIS)
Total :	0.948	31	286		12	214		226	
Cleared land :	0.007								
Coconut :	0.481	24	36		6	9		15	
Cocoa :	0.346								
Grain Crops :	0.001								
Cabbage :	0.001								
Vegetable :	0.001								
Sweet Potato :	0.108	7	249		6	203		209	
Taro :									
Pana :	0.002		2			2		2	
Cassava :	0.001								
Other									

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	% contribution to family labour men	% contribution to family labour women
Labour units available	1.99	1.76	1.00					
Total	16	163		6	122		10	90
Cleared land								
Coconut	12	20		3	5		40	60
Cocoa								
Grain Crops								
Cabbage								
Vegetable								
Sweet Potato	4	141		3	116		3	97
Taro								
Pana		1			1			100
Cassava								

Derived from household composition labour availability
% contribution to family labour is derived from the table above

LAND CLEARANCE
Annual Labour per Holding

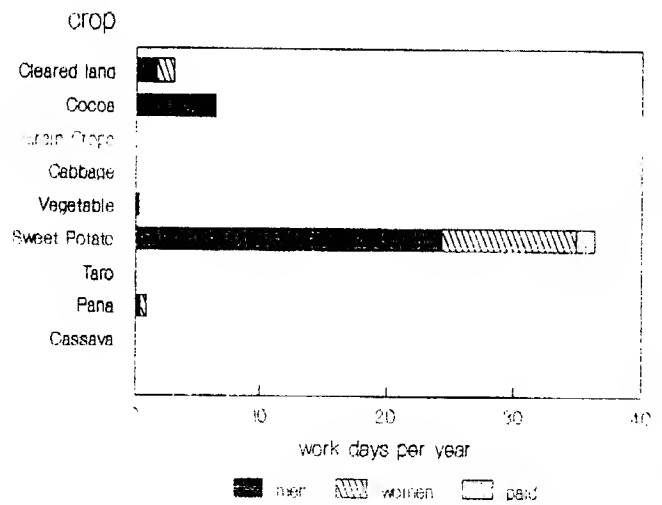


Diagram: A2.1

CULTIVATION
Annual Labour per Holding

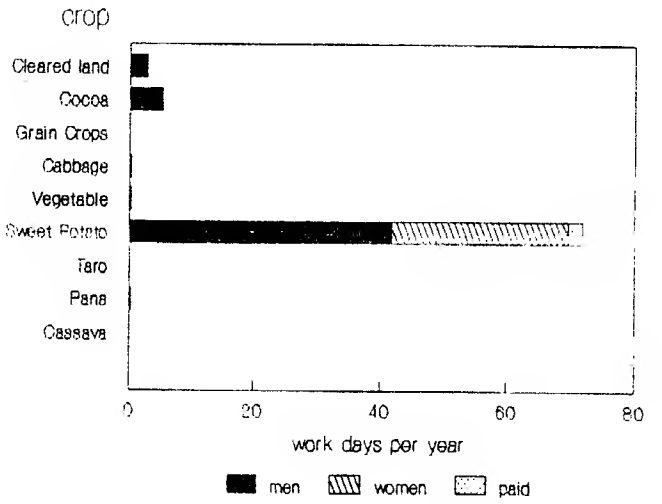


Diagram: A2.2

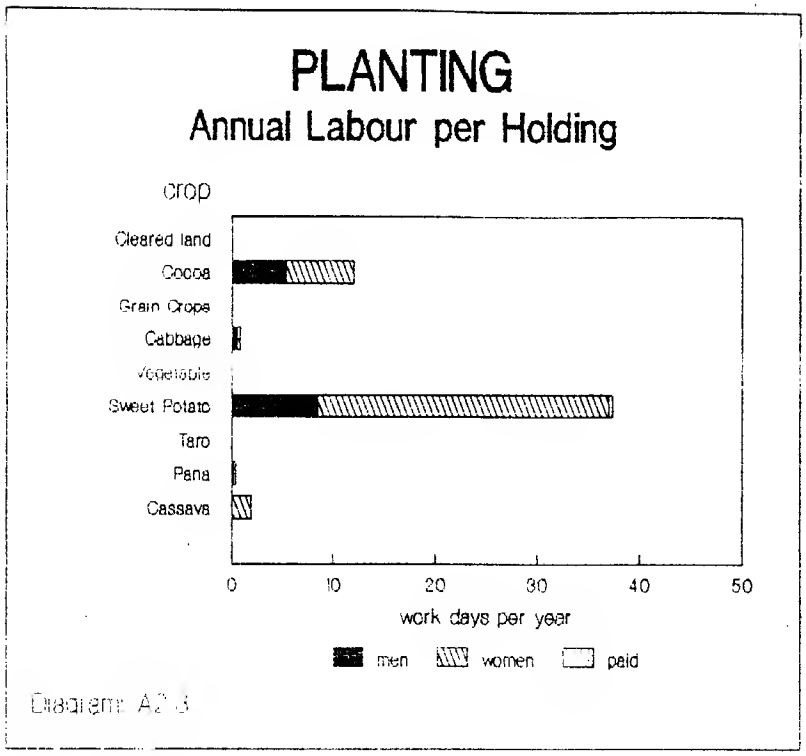


Diagram: A2.3

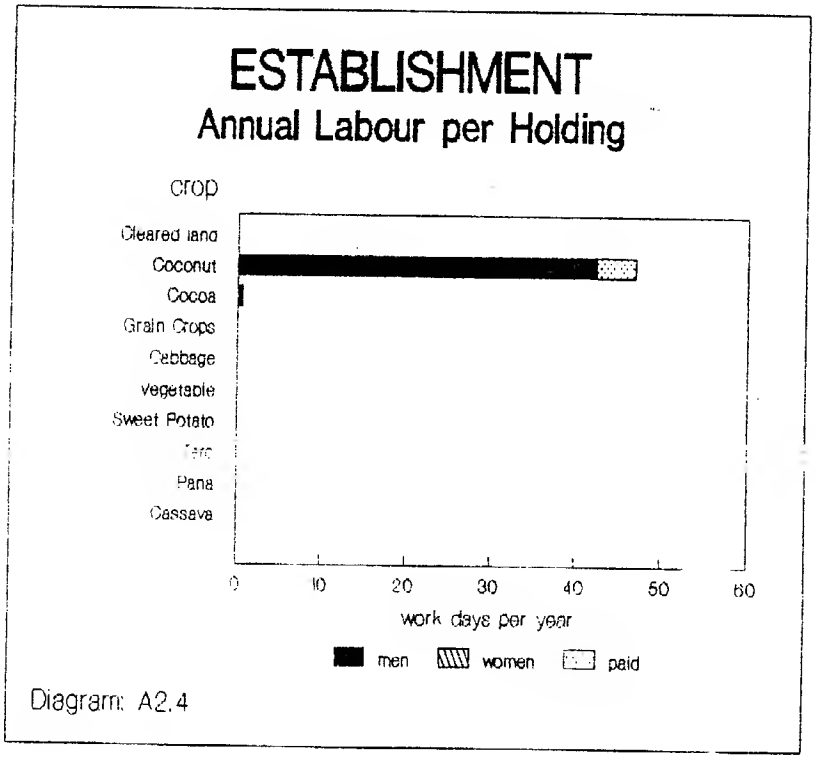


Diagram: A2.4

MAINTENANCE
Annual Labour per Holding

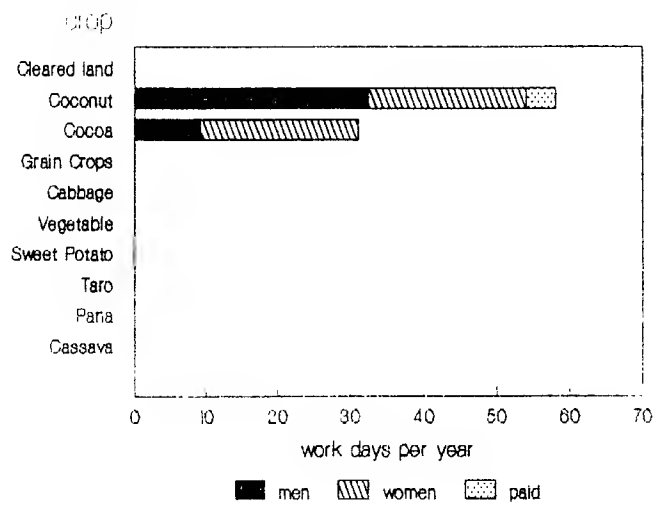


Diagram: A2.5

FIRST WEEDING
Annual Labour per Holding

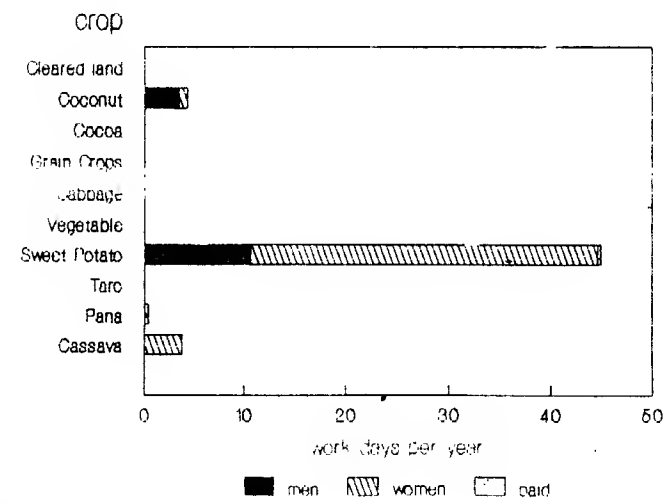


Diagram: A2.6

SECOND WEEDING
Annual Labour per Holding

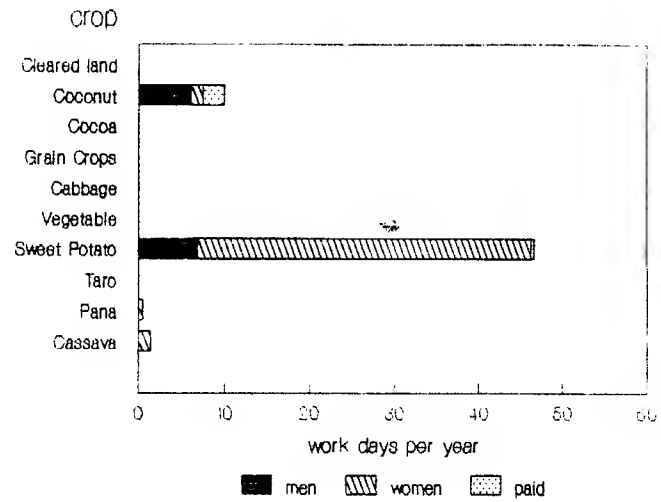


Diagram: A2.7

THIRD WEEDING
Annual Labour per Holding

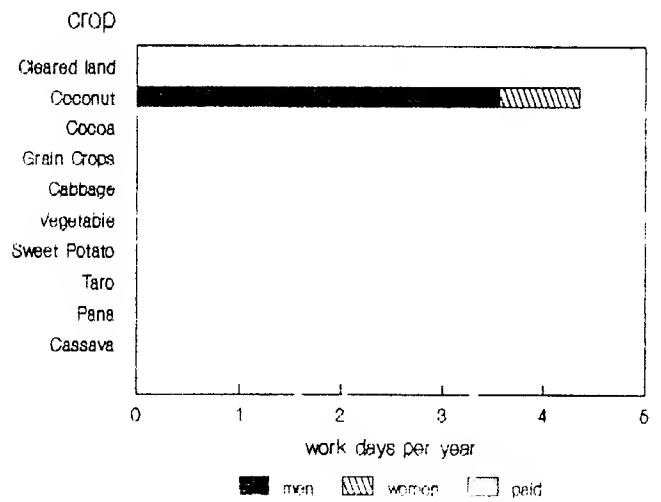


Diagram: A2.8

HARVESTING
Annual Labour per Holding

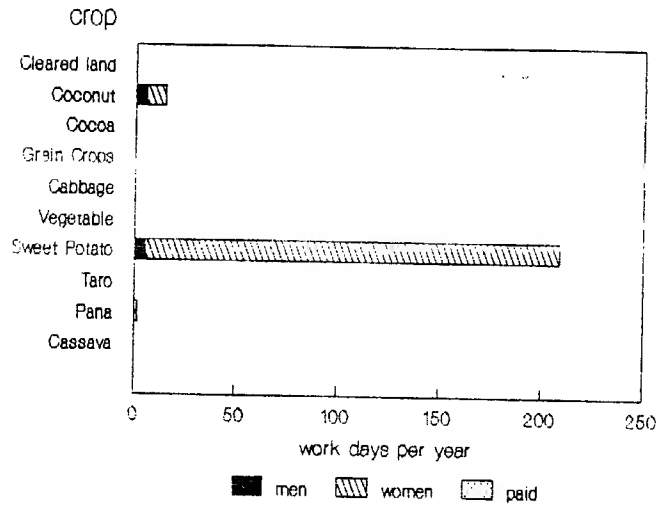


Diagram: A2.9

Annex: 3
CROP DAMAGE

A3.1 The following analysis of crop damage is based on observations of crop mixtures at the plot level. Tables show the dominant crop growing in the mixture, but damage encountered may refer to other crops in the plot. In the present analysis it is possible only to present results at the plot level, and not at the crop level.

Table: A3.1a
CROP DAMAGE DUE TO INSECTS - AFFECTING LEAVES

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		62	17	2		156	52	48
cleared land	a					11		100
coconut	b	2	1			12	25	75
cocoa	c					2		100
coconut + cocoa	z					3		100
grain crops	e					1		100
cabbage	g	3	2			5	100	
vegetables	h	1	1			3	67	33
sweet potato	r	55	13	2		108	65	35
taro	s					1		100
yam	t					-		100
pana	u	1				6	17	83
cassava	v					3		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		8	6			14	86
cleared land	a	-					100
coconut	b	5	11			16	84
cocoa	c						100
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r	50				50	50
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.1b
CROP DAMAGE DUE TO INSECTS - AFFECTING FRUITS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		33	12	1		156	29	71
cleared land	a					11		100
coconut	b	7	1			12	67	33
cocoa	c	1				2	50	50
coconut + cocoa	z	2				3	67	33
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r	20	11	1		108	30	70
taro	s	1				1	100	
yam	t					1		100
pana	u	2				6	33	67
cassava	v					3		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		39				39	61
cleared land	a						100
coconut	b	47				47	53
cocoa	c	100				100	
coconut + cocoa	z	33				33	67
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.1c
CROP DAMAGE DUE TO INSECTS - AFFECTING ROOTS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		4	4			156	5	95
cleared land	a					11		100
coconut	b					12		100
cocoa	c					2		100
coconut + cocoa	z					3		100
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r	2	4			108	6	94
taro	s					1		100
yam	t					1		100
pana	u	2				6	33	67
cassava	v					3		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
cleared land	a						100
coconut	b						100
cocoa	c						100
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.2a
CROP DAMAGE DUE TO DISEASE - AFFECTING LEAVES

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		19	1	3		156	15	85
cleared land	a					11		100
coconut	b	1				12	8	92
cocoa	c					2		100
coconut + cocoa	z					3		100
grain crops	e					1		100
cabbage	g	1		1		5	40	60
vegetables	h	1		1		3	67	33
sweet potato	r	14	1	1		108	15	85
taro	s					1		100
yam	t					1		100
pana	u	1				6	17	83
cassava	v	1				3	33	67

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		6				6	94
cleared land	a						100
coconut	b	5				5	95
cocoa	c						100
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r	25				25	75
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.2a
CROP DAMAGE DUE TO DISEASE - AFFECTING FRUITS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		7				156	4	96
cleared land	a					11		100
coconut	b	4				12	33	67
cocoa	c	1				2	50	50
coconut + cocoa	z	2				3	67	33
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r					108		100
taro	s					1		100
yam	t					1		100
pana	u					6		100
cassava	v					3		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		39				39	61
cleared land	a						100
coconut	b	47				47	53
cocoa	c	100				100	
coconut + cocoa	z	33				33	67
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.2c
CROP DAMAGE DUE TO DISEASE - AFFECTING ROOTS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots						156		100
cleared land	a					11		100
coconut	b					12		100
cocoa	c					2		100
coconut + cocoa	z					3		100
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r					108		100
taro	s					1		100
yam	t					1		100
pana	u					6		100
cassava	v					3		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
cleared land	a						100
coconut	b						100
cocoa	c						100
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.3
CROP DAMAGE DUE TO HUMANS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		2				156	1	99
cleared land	a					11		100
coconut	b	2				12	17	83
cocoa	c					2		100
coconut + cocoa	z					3		100
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r					108		100
taro	s					1		100
yam	t					1		100
pana	u					6		100
cassava	v					3		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		3				3	97
cleared land	a						100
coconut	b	5				5	95
cocoa	c						100
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.4
CROP DAMAGE DUE TO FIRE

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots					156		100
cleared land	a				11		100
coconut	b				12		100
cocoa	c				2		100
coconut + cocoa	z				3		100
grain crops	e				1		100
cabbage	g				5		100
vegetables	h				3		100
sweet potato	r				108		100
taro	s				1		100
yam	t				1		100
pana	u				6		100
cassava	v				3		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
cleared land	a						100
coconut	b						100
cocoa	c						100
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.5
CROP DAMAGE DUE TO FLOOD

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		4				156	3	97
cleared land	a					11		100
coconut	b					12		100
cocoa	c					2		100
coconut + cocoa	z					3		100
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r	2				108	2	98
taro	s					1		100
yam	t					1		100
pana	u	1				6	17	83
cassava	v	1				3	33	67

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
cleared land	a						100
coconut	b						100
cocoa	c						100
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.6
CROP DAMAGE DUE TO WIND

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		2				156	1	99
cleared land	a					11		100
coconut	b	1				12	8	92
cocoa	c	1				2	50	50
coconut + cocoa	z					3		100
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r					108		100
taro	s					1		100
yam	t					1		100
pana	u					6		100
cassava	v					3		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		6				6	94
cleared land	a						100
coconut	b	5				5	95
cocoa	c	100				100	
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.7
CROP DAMAGE DUE TO RATS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		35	8	1		156	28	72
cleared land	a					11		100
coconut	b	1				12	8	92
cocoa	c	1				2	50	50
coconut + cocoa	z					3		100
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r	31	6	1		108	35	65
taro	s		1			1	100	
yam	t					1		100
pana	u	1	1			6	33	67
cassava	v	1				3	33	67

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		8				8	92
cleared land	a						100
coconut	b	5				5	95
cocoa	c	100				100	
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r	25				25	75
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.8
CROP DAMAGE DUE TO BIRDS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		29	5	1		156	22	78
cleared land	a					11		100
coconut	b	3				12	25	75
cocoa	c	1				2	50	50
coconut + cocoa	z					3		100
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r	22	4	1		108	25	75
taro	s		1			1	100	
yam	t					1		100
pana	u	1				6	17	83
cassava	v	2				3	67	33

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		17				17	83
cleared land	a						100
coconut	b	21				21	79
cocoa	c	100				100	
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r	25				25	75
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.9
CROP DAMAGE DUE TO BATS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		2				156	1	99
cleared land	a					11		100
coconut	b					12		100
cocoa	c	1				2	50	50
coconut + cocoa	z					3		100
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r	1				108	1	99
taro	s					2		100
yam	t					1		100
pana	u					6		100
cassava	v					3		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		3				3	97
cleared land	a						100
coconut	b						100
cocoa	c	100				100	
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.10
CROP DAMAGE DUE TO LIVESTOCK

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		1				156	1	99
cleared land	a					11		100
coconut	b					12		100
cocoa	c					2		100
coconut + cocoa	z	1				3	33	67
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r					108		100
taro	s					1		100
yam	t					1		100
pana	u					6		100
cassava	v					3		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		22				22	78
cleared land	a						100
coconut	b						100
cocoa	c						100
coconut + cocoa	z	67				67	33
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.11
CROP DAMAGE DUE TO OTHER FACTORS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		1	2	1	1	156	3	97
cleared land	a					11		100
coconut	b					12		100
cocoa	c					2		100
coconut + cocoa	z					3		100
grain crops	e					1		100
cabbage	g					5		100
vegetables	h					3		100
sweet potato	r	1	2	1	1	108	5	95
taro	s					1		100
yam	t					1		100
pana	u					6		100
cassava	v					3		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
cleared land	a						100
coconut	b						100
cocoa	c						100
coconut + cocoa	z						100
grain crops	e						100
cabbage	g						100
vegetables	h						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100
cassava	v						100

Note: The table of % area is only approximate due to rounding small numbers

Annex: 4
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